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KEY TO PRONUNCIATION.

ä	far, father
ā	fate, hate
a or ă	at, fat
ã	air, care
ạ	ado, sofa
â	all, fall
ch	choose, church
ē	eel, we
e or ĕ	bed, end
ė	her, over: also Fr. *e*, as in *de; eu*, as in *neuf;* and *oeu*, as in *boeuf, coeur;* Ger. *ö* (or *oe*), as in *ökonomie.*
ẹ	befall, elope
ẽ	agent, trident
ff	off, trough
g	gas, get
gw	anguish, guava
h	hat, hot
h or H	Ger. *ch*, as in *nicht, wacht*
hw	what
ī	file, ice
i or ĭ	him, it
ị̂	between e and i, mostly in Oriental final syllables, as, Ferid-ud-din
j	gem, genius
kw	quaint, quite
ṅ	Fr. nasal *m* or *n*, as in *embonpoint, Jean, temps*

ñ	Span. *ñ*, as in *cañon* (căn′yŏn), *piñon* (pēn′yŏn)
ng	mingle, singing
nk	bank, ink
ō	no, open
o or ŏ	not, on
ô	corn, nor
ȯ	atom, symbol
ọ	book, look
oi	oil, soil; also Ger. *eu*, as in *beutel*
ö or oo	fool, rule
ou or ow	allow, bowsprit
s	satisfy, sauce
sh	show, sure
th	thick, thin
ŧh	father, thither
ū	mute, use
u or ŭ	but, us
u̇	pull, put
ü	between u and e, as in Fr. *sur*, Ger. *Müller*
v	of, very
y	(consonantal) yes, young
z	pleasant, rose
zh	azure, pleasure
′(prime), ″(secondary)	accents, to indicate syllabic stress

THE ENCYCLOPEDIA AMERICANA

M

MEYER, mī'ĕr, **Adolf,** American pathologist and alienist: b. Niederwenigen, near Zürich, Switzerland, 13 Sept. 1866. He was educated at Zürich, Paris, London, Edinburgh, Vienna and Berlin, and came to the United States in 1892. He was honorary Fellow and docent at the University of Chicago in 1892–95, and pathologist to the Illinois Eastern Hospital for the Insane at Kankakee in 1893–95. He was pathologist and later director of the clinical and laboratory work at the Worcester, Mass., Insane Hospital and docent in psychiatry at Clark University in 1895–1902. He was director of the Pathological Institute at the New York State Hospital in 1902–10; professor of psychiatry at the Cornell University Medical College in 1904–09; and since 1910 has been professor of psychiatry and director of the Henry Phipps Psychiatric Clinic at Johns Hopkins University. He is a member of the New York Academy of Sciences, served as president of the New York Psychiatric Society and has contributed to scientific periodicals.

MEYER, Adolf Bernhard, German zoologist and anthropologist: b. Hamburg, 11 Oct. 1840; d. Dresden, 22 Aug. 1911. He was educated at the universities of Göttingen, Vienna, Zürich and Berlin, later making explorations in the Malays and in the Philippines. He was director of the Royal Museum of Natural History at Dresden from 1874 until his retirement in 1905. Author of ‹Abbildungen von Vogelskeletten› (1879–95); ‹Publikationen des königlichenethnographischen museums zu Dresden› (1881–1903); ‹Album von Philippinentypen› (1885–1904); ‹Amerikanische Bibliotheken und ihre Bestrebungen› (1906); ‹Römerstadt Agunt› (1908), etc.

MEYER, Annie Nathan, American dramatist, author and educationalist: b. New York, 19 Feb. 1867. She was educated at home and took examinations at Columbia University, women not then being admitted to the university. She was married to Dr. Alfred Meyer in 1887 and is known for her work as a founder of Barnard College, the women's department at Columbia. She has been active as an anti-suffragist. Author of ‹Woman's Work in America› (1891); ‹Helen Brent, M.D.› (1893); ‹My Park Book› (1898); ‹Robert Annys› (1901); ‹The Dominant Sex› (1911); ‹The Dreamer› (1912).

MEYER, Balthasar Henry, American railway economist: b. Mequon, Wis., 28 May 1866. He was graduated at the University of Wisconsin in 1894 and later studied at Berlin. He was connected with the staff of the University of Wisconsin from 1895 and was professor of political economy there in 1900–10. He was appointed a member of the Railroad Commission of Wisconsin in 1905, and served as its chairman in 1907–11. President Taft appointed him to the Railroad Securities Commission in 1910 and to the Interstate Commerce Commission in 1911. Author of ‹Railway Legislation in the United States› (1903); ‹History of Transportation in the United States Before 1860› (1917).

MEYER, Conrad Ferdinand, Swiss novelist and poet: b. Zürich, 11 Oct. 1825; d. Kilchberg, near Zürich, 1898. He devoted himself in his earlier years chiefly to studies in history and art. The two historians who influenced Meyer particularly were Vulliemin at Lausanne and Jacob Burckhardt at Bâle whose book on the ‹Culture of the Renaissance› stimulated his imagination and interest. From his travels in France and Italy (1857) Meyer derived likewise much inspiration for the settings and characters of his historical novels. His mind matured slowly and it was not until the Franco-Prussian War in 1870 that he found himself and his genius. In Meyer's novels a great crisis will often release latent energies and precipitate a catastrophe. In the same manner his own life which so far had been one of dreaming and experimenting, was stirred to the very depths by the events of 1870. Meyer identified himself with the German cause and as a manifesto of his sympathies published the little epic, «Hutten's Last Days» in 1871. The following two decades from 1870 to 1890 were the years of harvesting and brought to light a number of historical novels and tales.

C. F. Meyer's works include six long and five shorter historical tales, two short epic poems and a volume of lyrics, among them some ballads of exceptional merit. The periods of the Renaissance and Counter Reformation furnished the subjects for most of his novels in which the æsthetic charm of a picturesque setting is combined with keen psychological analysis. ‹Jürg Jenatsch› describes the political plots and intrigues in which the Swiss canton, Graubünden, became involved during the Thirty Years' War through the conflict between Spain-Austria and France. The hero is a Protestant minister and fanatic patriot who, in his determination to preserve the independence of his little country, does not shrink from murder and treason and in whom noble and base motives are strangely blended. ‹The Saint› tells the story of Thomas à Becket of Canterbury who, from being a devoted servant of his worldly lord, King Henry II, turns against him when he is made archbishop of Canterbury and henceforth serves the interest of a higher lord or his representative, the Church of Rome. In the ‹Monk's Wedding› Dante himself is introduced at the court of Cangrande in Verona as narrator of the strange adventure of a monk who, after the death of his brother, is forced by his father to break his vows but who, instead of marrying the widow, falls in love with another young girl and runs blindly to his fate. ‹Die Richterin,› a more sombre tale, introduces Charlemagne and his palace school; ‹The Tempting of Pescara› tells of the great crisis in the life of Pescara, general of Charles V and husband of Victoria Colonna. Among his shorter stories may be singled out ‹Gustav Adolf's Page,› ‹Plautus in a Nunnery› and ‹The Shot from the Pulpit› as three gems of his inimitable art. Most of his plots spring from the deeper conflict between freedom and fate and culminate in a dramatic crisis in which the hero, in the face of a great temptation, loses his moral freedom and is forced to fulfill the higher law of destiny. As a psychologist and interpreter of enigmatic characters Meyer has not his equal in the field of the historical novel. See SAINT, THE.

Bibliography.— C. F. Meyer's works are published by H. Haessel, Leipzig, in 9 volumes. The most recent and complete biography is by D'Harcourt, R., ‹C. F. Meyer: Sa vie son œuvre› (Paris 1913). Two older biographies by Langmesser, A. (Berlin 1905), and Frey, A. (Stuttgart 1909). Other monographs: Taylor, M. L., ‹A Study of the Technique of C. F. Meyer's Novellen› (Chicago 1909); Blaser, O., ‹C. F. Meyer's Renaissancenovellen› (Berne 1905); Korrodi, E., ‹C. F. Meyer: Studien› (Leipzig 1912). Several novels are accessible in annotated American editions, but only two, so far, in translations: ‹The Monk's Wedding› (Boston 1887); and ‹The Tempting of Pescara› (New York 1890). Consult also, ‹German Classics of the Nineteenth Century,› Vol. 14.

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MEYER, George von Lengerke, American Cabinet officer and diplomat: b. Boston, 24 June 1858; d. 9 March 1918. He was graduated at Harvard in 1879, and engaged in business as merchant and trustee in 1879–99. He was a director of various trust companies, banks, manufacturing companies, and public utilities concerns, and was a member of the Boston common council in 1889–90. He served in the Massachusetts house of representatives in 1892–97, acting as speaker in 1894–97, and was a member of the Republican National Committee in 1898–1904. He was ambassador extraordinary and plenipotentiary to Italy in 1900–05, and to Russia in 1905–07. He served as Postmaster-General under President Roosevelt in 1907–09, and in the Taft Administration he was Secretary of the Navy. He has been an overseer of Harvard University since 1911.

MEYER, Hans, German explorer and publisher: b. Hildburghausen, 22 March 1858. He was educated at Leipzig, Berlin and Strassburg, afterward traveling in India, North America and South Africa. Subsequently he visited East Africa and South America. He entered the publishing house of his father, the Bibliographisches Institut at Leipzig, in 1884, and in the following year became one of the directors of the firm; but at intervals he continued his exploring expeditions. Among his explorations are the ascent and survey of the summit of Kilbo Peak in East Africa in 1889 and 1898; and the Ecuadorian Cordilleras in 1903. Author of ‹Zum Schneedom des Kilimandscharo› (1888); ‹Der Kilimandjero› (1900); ‹Die Eisenbahnen im tropischen Africa› (1902); ‹In den Hoch Anden von Ecuador› (1907), etc.

MEYER, Heinrich August Wilhelm, German biblical commentator: b. Gotha, 10 Jan. 1800; d. Hanover, 21 June 1873. He studied at Jena, was pastor at Harste, Hoye and Neustadt, and upon his retirement in 1848, settled in Hanover. He is remembered for his ‹Commentaries on the New Testament,› begun 1832 and completed 1859. Since his death this work has been continued by Weiss, Wendt, Beyschlag and others. The English translation in Clark's series is in 20 volumes (1873–82), and there is an American edition in 11 volumes (1884–88).

MEYER, Henry Herman, American Methodist Episcopal clergyman and editor: b. Champaign, Ill., 21 Nov. 1874. He was educated at German Wallace College, Ohio; the Drew Theological Seminary; Teachers' College, Columbia; and at Jena. He was ordained in the ministry in 1900 and filled pastorates in Wilmington, Cal., and Mount Vernon, N. Y. He was professor of Saint Paul's College, Minnesota, in 1900–01; and in 1903 became assistant editor of the Methodist Episcopal Sunday School publications, becoming editor in 1914. Author of ‹The Lesson Handbook› (annual 1904–); ‹The Graded Sunday School in Principle and Practice› 1910), etc.

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‹Public Ownership and the Telephone in Great Britain› (1907).

MEYER, Johann Georg, commonly known as «Meyer von Bremen,» German painter: b. Bremen, 28 Oct. 1813; d. Berlin, 4 Dec. 1886. In his 21st year he went to Düsseldorf and began his studies under Sohn and Schadow; in 1841 he opened a studio of his own but removed to Berlin as his fame increased (1853). While scenes from the Bible were first the subjects of his brush, he later turned his attention to incidents of popular life, especially among the Hessian peasantry, and finally to the portrayal of family life in its pathetic aspect. Such pictures as ‹The Jubilee of a Hessian Pastor› (1843); ‹Christmas Eve›; ‹Blindman's Buff›; ‹The Soldier's Return›; ‹The Inundation› (1846); ‹The Repentant Daughter› (1852, in the gallery at Bremen), are full of intense sympathy with the «simple annals of the poor.» After taking up his residence at Berlin, he chose especially scenes from child life, which he rendered with spirited humor. Among his pictures of this kind are ‹The Fairy Tale›; ‹Children Playing Blindman's Buff›; ‹Grandfather and Grandchild,› etc. A third group of his pictures includes those of young women, as single figures or in groups. Such are ‹The Tryst›; ‹The Love Letter.› An excellent example of his work, ‹The Letter› (1873), is in the Metropolitan Museum, New York. All his works are distinguished by true human feeling, truthfulness and thoroughness of execution.

MEYER, Joseph, German publisher: b. Gotha, 9 May 1796; d. 27 June 1856. He organized various industrial undertakings, founded a publishing business at Gotha, which soon attained large proportions, was removed by him to Hildburghausen (1828), and in 1874 was transferred to Leipzig. The best known of his publications is the ‹Meyers Konversations-lexikon,› the rival of Brockhaus in the encyclopædia field, which has been brought down to date by constant revisions and supplements. He published also a series of the German Classics, a ‹Historical Library,› and a ‹Library of Natural Philosophy.›

MEYER, Kuno, German Celtic scholar: b. Hamburg, 20 Dec. 1858. He was educated at the Gelehrtenschule of the Johanneum, Hamburg, and at the University of Leipzig. In 1884–95 he was lecturer, and in 1895–1915, professor of Teutonic languages at University College, Liverpool; and from 1911 he was professor of Celtic at the University of Berlin. He founded the *Zeitschrift für Celtische Philologie* in 1895, and with Whitley Stokes founded the *Archiv für Celtische Lexikographie* in 1898. He founded the School of Irish Learning at Dublin in 1903. He is a member of the Royal Prussian Academy. His pro-German sympathies brought him into disfavor in England and Ireland after the outbreak of the European War. Author of ‹Eine irische Version der Alexandersage› (1883); ‹The Irish Odyssey› (1885); ‹The Vision of MacConglinne› (1892); ‹Early Relations of the Brython and Gael› (1896); ‹Liadain and Curithir› (1902); ‹Ancient Irish Poetry› (1911), etc.

MEYER, Lothar Julius, German chemist: b. Varel, Oldenburg, 19 Aug. 1830; d. Tübingen, 11 April 1895. He studied medicine at Zürich and Würzburg and later specialized in physiological chemistry at Heidelberg, and in mathematical physics at Königsberg. He became privatdocent in physics and chemistry at Breslau in 1859, taught in the School of Forestry at Neustadt-Eberswalde in 1866–68, and at the Karlsruhe Polytechnic in 1868–76; and from 1876 he was professor of chemistry at Tübingen. He is known for his theory of the action of carbon monoxide on the blood; and for his work in the periodic classification of the elements. Author of ‹Die modernen Theorien der Chemie› (1896); ‹Die Stomgewichte der Elemente aus den Originalzahlen neu berechnet› (1883); ‹Grundzüge der theoretischen Chemie› (1902).

MEYER, [Marie] Paul Hyacinthe, French philologist: b. Paris, 17 Jan. 1840; d. 19 March 1917. He was educated at the Lycée Louis le Grand and at the École des Chartes, specializing in the Romance languages. He was attached to the manuscript department of the Bibliothèque Nationale in 1863–65, and in 1865 founded the *Revue Critique.* He was keeper of the national archives in 1866–72 and in 1872 founded *Romania,* to which he was the leading contributor. He was appointed professor of the languages and literatures of southern Europe at the College of France in 1876, and from 1882 he was a director of the École Nationale des Chartes. He became honorary professor at the College of France in 1906. His work in connection with romance literature is of exceptional value and he is considered the leading modern authority on the French language. He was a member of the Institute of France, a commander in the Legion of Honor and an associate of the British Academy. He edited a large number of old French texts, many of which were for the Société de l'histoire de France and the Société des anciens textes français. Among them are ‹Aye d'Avignon› (1861); ‹Flamença› (1865); ‹Histoire Guillaume le Maréchal, comte de Striguil et de Pembroke› (3 vols., 1891–1901); ‹Fragments d'une vie de Saint Thomas de Cantorbéry› (1885), etc. Author of ‹Rapports sur les documents manuscrits de l'ancienne littérature de la France conservés dans les bibliothèques de la Grande Bretagne› (1871); ‹Recueil d'anciens textes bas-Latins, provencaux et français› (2 parts, 1874–76); ‹Alexandre le Grand dans la littérature française du moyen âge› (2 vols., 1886); ‹Histoire des relations de la France avec Venise› (1896); ‹Documents linguistiques du midi de la France› (1909), etc.

MEYER, Victor, German chemist: b. Berlin, 8 Sept. 1848; d. Heidelberg, 8 Aug. 1897. He studied at the University of Berlin and under Bunsen at Heidelberg. In 1868 he entered the laboratory of Baeyer at Berlin, and in 1871 he became professor at the Stuttgart Polytechnic. He was professor of chemistry and director of the laboratory at Zürich in 1872–85, professor at Göttingen in 1885–89, and from 1889 until his death he occupied the chair of his former master, Bunsen, at Heidelberg. He is famous for his experiments establishing a method of determining vapor densities and for the discovery of thiophen. He was awarded the Davy medal of the Royal Society in 1891. Author of ‹Die Thiophengruppe› (1888); ‹Chemische Probleme der Gegenwart› (1890);

‘Lehrbuch der organischen Chemie’ (2 vols., 1891–92); ‘Märztage im Kanarischen Archipel’ (1893), etc.

MEYER-HELMUND, Erik, Russian-German composer: b. Petrograd, 25 April 1861. He studied in Berlin and became known as a composer of appealing songs, for many of which he wrote both words and music. Author of the operas ‘Margitta’ (1889); ‘Der Liebeskampf’ (1892); ‘Heines’ Traumbilder’ (1912); the burlesques ‘Trischka’ (1894); ‘Lucullus’ (1905), and the light opera ‘Taglioni’ (1912).

MEYER-LÜBKE, Wilhelm, German-Swiss philologist: b. Dübendorf, Switzerland, 30 Jan. 1861. He was educated at the universities of Zürich and Berlin, and in 1887 became professor at Jena. He was appointed professor of Romance philology at Vienna in 1890, serving as rector in 1906–07. Author of ‘Grammatik der romanischen Sprachen’ (4 vols., 1890–1905); ‘Italienische Grammatik’ (1891); ‘Einfuhrung in das Studium der romanischen Sprachwissenschaft’ (1901); ‘Historische Grammatik der französischen Sprache’ (1908); ‘Romanisches Wörterbuch’ (1912), etc.

MEYERBEER, mī′ĕ-bār, **Giacomo** (Italianized form of Jakob Meyer Beer), German composer: b. Berlin, 5 Sept. 1791; d. Paris, 2 May 1864. His father, Jakob Beer, was a rich banker of Jewish descent, and of high reputation in the commercial world. The son gave early proof of his devotion to the art of music, and at nine was regarded as a masterly pianist in a city famous for its excellent musicians. After studying composition under Bernhard Anselm Weber, he entered in 1810 the school of the Abbé Vogler at Darmstadt, where for three years he had the companionship of Karl Maria von Weber (q.v.). An intimate friendship sprang up between them, which was only interrupted by the death of the latter. While at Darmstadt Meyerbeer composed a cantata, ‘Gott und die Natur,’ which brought him the appointment of court musician to the grandduke. In 1811 his opera ‘Jephthas Gelübde’ was produced at Munich, but failed to please the audience, though highly praised by Weber, Vogler and other musical authorities. Discouraged by its public reception, Meyerbeer went to Vienna, where he made his début as a pianist with such success that he seemed destined to eclipse the fame of all contemporary artists. Commissioned by the court of Vienna he produced ‘Alimelek, oder die beiden Kalifen,’ which was no more successful than his former effort. He was induced to visit Italy, and became a convert to the new musical school of that country. He rapidly composed in this style a series of operas, which were generally well received: ‘Romilda e Costanza’ (1818); ‘Semiramide riconosciuta’ (1819); ‘Emma di Resburgo’ (1819); ‘Margherita d'Anjo’ (1820); ‘L'Esule di Granata’ (1822); and ‘Il crociato in Egitto’ (1824). The success of the last-mentioned opera traveled beyond the Alps, and the composer was invited to Paris to superintend the preparations for the production of the ‘Crociato’ at the Grand Opéra, where it met with an enthusiastic reception. In 1831 his ‘Robert le Diable’ was produced for the first time, and the excitement it caused was perhaps unparalleled on the Parisian stage. Meyerbeer had ceased to be a pupil of Rossini, and ‘Robert’ combined in a singular degree oriental gorgeousness, German massiveness, French vivacity and Italian brilliancy, which the preceding works of the composer had not prepared the world to expect. He reached the climax of his fame by his next opera, ‘Les Huguenots’ (1836). He was appointed Royal music director at Berlin in 1842, and returned to Paris in 1849. ‘Les Huguenots’ was followed at long intervals by ‘Le Prophete’ (1849); ‘Pierre le Grand’ (‘L'Etoile du Nord’ 1854); ‘Le Pardon de Ploërmel’ (‘Dinorah’ 1858); and ‘L'Africaine’ (1865). The composer did not live to see the production of his last work. Besides his operas he wrote many songs, an oratorio, cantatas, a Te Deum, music for the tragedy of ‘Struensee’ by his brother, and other works. Consult De Curzon, H., ‘Meyerbeer: biographie critique’ (1910); De Bury, ‘Meyerbeer, savie, ses œuvres et son temps’ (1865); Hervey, A., ‘Meyerbeer’ (1913); Mendel, ‘Giacomo Meyerbeer, eine biographié’ (1868); Pougin, ‘Meyerbeer’ (1864).

MEYERHEIM, Friedrich Eduard, frēd′rĭh ed′oo-ard mī′ĕ-hīm, German artist: b. Dantzic, 7 Jan. 1808; d. Berlin, 18 Jan. 1879. He studied landscape painting in his native town, and in his 22d year went to Berlin, where he attended the Academy and fell under the influence of Schadow. He became a member of the Berlin Academy in 1838, and a professor there in 1850. Ten lithographic views of Dantzic, published by him in 1832, were included in his ‘Architektonische Denkmäler der Altmark Brandenburg,’ which appeared the following year. Between 1833 and 1841 he produced a number of genres with a romantic motif as illustrative of peasant and bourgeoise life. Of such a character is ‘The Champion Shot’ (1836) in the Berlin National Gallery. In his search for character, costume, scenery and incident he traveled, studied and sketched over a wide area of territory, which included Westphalia, Altenburg, Thuringia, Hesse and the Harz district. His admirable genres are distinguished by a clear enamel-like coloring. Amongst the most notable are ‘Leaving Church in Altenburg’; ‘In an Altenburg Cornfield’; ‘The Little Kid’ (1842); ‘Bedfellows’ (1844); his masterpiece, ‘Waiting’ (1845); and ‘Good Morning, Dear Father’ 1858). Consult his ‘Autobiography’ (1880).

MEYERHEIM, Paul, German painter: b. Berlin, 13 July 1842. He was a son of Friedrich Eduard Meyerheim and was taught by his father, and afterward studied at the Berlin Academy. Travel through Belgium and Holland enlarged his artistic experience and knowledge, and he afterward spent a year at Paris. He then returned to Berlin, where he applied himself to animal painting, but also did some portrait, genre of common life, humorous scenes, still life, interior decoration of buildings, etc. He executed works both in oil and watercolors, and his versatility is only equaled by his delicate sense of color and brilliant technique. Considering all these qualities his fertility must be called extraordinary. Some of his best works are ‘History of the Locomotive in Seven Pictures on Copper’ (Villa Borsig, Berlin); ‘An Antiquary of Amsterdam’ (1869); ‘Four Seasons in the Life of a Bird’;

‘In the Menagerie’ (1891); ‘Portrait of his Father and D. Chodowiecki’ (1887); ‘The Theatre of Monkeys’; ‘The Hare and the Frog’; ‘Tourists in the Mountains Meeting a Herd of Cattle’; etc. In 1863 he undertook a journey into Egypt, from which he brought back many landscape and figure studies. He is a Royal professor, and has been awarded the grand gold medal at the Berlin Exhibition.

MEYERSDALE, Pa., borough in Somerset County, on the Casselman River, 37 miles northwest of Cumberland, Md., and on the Baltimore and Ohio Railroad. The borough is located in a coal mining district, which forms its principal industry. There are also manufactories of bricks, machinery and cigars. Pop. 3,741.

MEYNELL, mī'nĕl, **Alice Thompson,** English poet: b. London, England 1850; d. there, 27 Nov. 1922. She was the daughter of T. J. Thompson, a friend of Dickens, spent much of her childhood in Italy, became a convert to Roman Catholicism, and was married in 1877 to Wilfrid Meynell, a London journalist. She published ‘Preludes,’ a collection of poems (1875), illustrated by her sister Elizabeth, Lady Butler; ‘Rhythm of Life’ (1893); ‘The Color of Life’ (1896); ‘The Children’ (1896); ‘The Spirit of Place’ (1898); ‘John Ruskin’ (1900); ‘Later Poems’ (1901). Consult Archer, ‘Poets of the Younger Generation’ (New York 1902); ‘Ceres’ Runaway’ (1910); ‘Mary, Mother of Jesus’ (1912); ‘Collected Poems’ (1913); ‘Essays’ (1914). The quality of her work stands very high, but her output in poetry has been small — her ‘Collected Poems’ contain only 76 pieces. She was regarded as the best of contemporary English poetesses, and her sister, Lady Butler, was the best woman artist of her time.

MEYRICK, mī'rĭk, **Frederick,** English Anglican clergyman and controversialist: b. Ramsbury vicarage, Wiltshire, 28 Jan. 1827; d. Blicking, 3 Jan. 1906. He was educated at Oxford, where he was tutor (1851–59) and he was ordained to the priesthood in 1852. Since 1868 he has been rector of Blicking, Norfolk, and a canon non-residentiary of Lincoln from 1869. He was moderately evangelical in his views and strongly anti-Roman, and labored for the establishment of a union between the Anglican and the old Catholic churches on the Continent. Among his many works, some of which are controversial books in Latin, Spanish, etc., may be cited ‘The Practical Working of the Church in Spain’ (1857); ‘University and Whitehall Sermons’ (1859); ‘Kingsley and Newman’ (1864); ‘Justin Martyr’ (1896); ‘Scriptural and Catholic Truth and Worship’ (1901); ‘Memories’ (1905).

MEZEN, mĕz-āny', or **MESEN,** a river in the northern part of Russia in Europe. It rises in the Timan Mountains, flows north and south, forming two loops, then its course changes to the northwest through the government of Archangel and enters the White Sea through Mezen Bay. It is about 510 miles in length. It is navigable for some distance from the mouth; but is ice-locked about six months in the year.

MEZEREON, mĕ-zē'rē-ŏn, or **MEZEREUM,** the dried bark of *Daphne mezereum Linné, Daphne gnidium Linné,* or *Daphne laureola Linné,* of the family *Thymeleaceæ.* All are hardy, low shrubs. *Daphne Mezereum* has a smooth, dark-gray bark easily separated from the wood. The flowers precede the leaves and are of a purplish rose-color, or very rarely, white, and are fragrant. The fruit is oval, bright red, or yellow from the white-flowered variety, fleshy and contains a single round seed. It is native to Europe and western Asia and has escaped cultivation in eastern United States and Canada. *Dæphne gnidium* has a deep purplish-brown bark and white flowers, the bark being equally active medicinally with *Daphne mezereum.* It is native to the dry, uncultivated portions of southern Europe. *Daphne laureola* or *Spurge laurel* has a purplish-gray bark and is used commercially, but its medicinal value is inferior. The bark of both stem and root is used, although that of the root was formerly thought superior. The dried bark of the *Daphne mezereum* is olive-brown; of *Daphne gnidium* purplish-brown; of *Dæphne laureola* purplish-gray. The taste is at first slight but is of increasing acridity and pungency. The bark is almost odorless. The berries and leaves of the plant are also active and have been known to prove fatal to children. The berries are used in Russia as a purgative; and a tincture is used in Germany as an external remedy for neuralgia. The application of the bark to the skin causes inflammation followed by vesication, and it has long been used as an epispastic in southern Europe. A small piece of the bark is moistened with vinegar and is applied and renewed twice daily until a blister is formed, and occasionally longer to insure discharge. Its action is slow, requiring 24 to 48 hours to vesicate. An ointment was formerly prepared to maintain discharge from blistered surfaces. It is of value in cases of obstinate ulcers, but valueless as an internal remedy. Overdoses produce nausea, vomiting and purging; and it has been known to act as a narcotic. It is used in combination with sarsaparilla in preparing the beverage of that name. See DAPHNE.

MEZES, Sidney Edward, American educator: b. Belmont, Cal., 23 Sept. 1863. He was graduated from the University of California in 1884 and received his doctor's degree from Harvard University in 1893. From 1892 to 1914 he was engaged in teaching, principally at the University of Texas, where he was professor of philosophy and dean of the college. In 1908 he was elected president of that university, and in 1914 he succeeded John H. Finley as president of the College of the City of New York. Dr. Mezes is ex-president of the Texas Academy of Science and has contributed many articles on ethical and philosophical subjects for reviews. His published works are ‘The Conception of God’ (1897); ‘Ethics, Descriptive and Explanatory’ (1901), and articles in reviews on education, ethics and philosophy.

MÉZIÈRES, Alfred Jean François, äl-frā zhŏṅ frän-swä mā-zē-ãr, French critic and politician: b. Rehón, 19 Nov. 1826; d. October 1915. He studied at the École Normale and in Athens; was professor of literature at Nancy (1854–61) and at the Sorbonne (1863); became an Academician in 1874; in politics was a member of the moderate Opportunists, and was deputy from 1881 to 1900, when he was elected senator for Meurthe-et-Moselle. Besides contributions to the *Revue des Deux Mondes* and *Temps,* he wrote ‘Shakespeare’ (1861); ‘Shakespeare's Predecessors and Contemporaries’ (1863); ‘Shakespeare's Contemporaries and Successors’ (1864); ‘Dante’ (1865); ‘Petrarch’ (1867); ‘Goethe’ (1872–73); ‘In France’ (1883); ‘Outside of France’ (1883); ‘Mirabeau’ (1891); ‘Petrarch’ (1895); ‘Dead and Living’ (1898); ‘The Passing Time’ (1906); ‘Portraits of Soldiers’ (1907); ‘Ulbina Verba’ (1914).

MÉZIÈRES, mā'zyār, **Philippe de,** French soldier, religious pilgrim and author: b. Chateau de Mézières, Picardy, about 1327; d. Paris, 29 May 1405. While still very young he served under Lucchino Visconti in Lombardy and shortly afterward under Andrew, king of Naples. He served with the French army in Smyrna in 1346, was knighted and afterward went to Jerusalem where he endeavored to found an order of knighthood to be maintained in the holy city for its protection against the Mohammedans. He visited Cyprus in 1347 and made a convert of Peter, the son of King Hugo IV; and after the accession of Peter to the throne, in 1358, he returned to the island and became his chancellor, probably in 1360. He was associated here with the legate Peter Thomas, who became patriarch of Constantinople in 1364. Mézières traveled with King Peter to the courts of western Europe, seeking support for a new crusade, and was with him at the capture of Alexandria in 1365. One-third of the booty was awarded Mézières for the creation of his order, the plan of which was laid forth in his ‘Nova religio passionis’ (1367–68), and which he extended in 1386 and 1396. Finding the Crusaders unwilling to aid him in realizing his dream Mézières was commissioned to visit Venice, Avignon and western Europe to enlist their aid for the kingdom of Cyprus against the sultan. Failing in his efforts he again sought converts for his order, but in 1368 returned to Cyprus, where he remained until the assassination of King Peter in 1369. In 1372 he was attached to the court of Pope Gregory XI, and in 1373 he became a counsellor of Charles V, at Paris. He enjoyed the king's full confidence and was tutor to his son, who became Charles VI. After the accession of Charles VI, however, Mézières retired to the Convent of the Celestines. He never lost touch with public affairs, but devoted himself chiefly to literature and the endeavor to establish his order at Jerusalem. His writings are of great historical value. His life of his friend and confrere, Peter Thomas, ‘Vita S. Petri Thomasii’ (Antwerp 1659), contains a highly valuable account of the Alexandrian expedition. Most of his writings concerned his project for the founding of his Order of the Passion, among them being ‘Songe du vieil pélerin’ (1389) and the autobiographical ‘Oratio trægedica.’ He was an earnest worker for friendship between England and France, and greatly desired the marriage of Richard II and Isabella of France, believing that it would ensure peace between the two countries and that his crusade could then be successfully inaugurated. His ‘Epître lamentable et consolatoire’ (1397) was written after the disaster which overtook the Crusade of 1396, which he had not thought well advised. Consult Jorga, N., ‘Philippe de Mézières et la croisade au xiv siécle’ (1896).

MÉZIÈRES, France, capital city of the Department of Ardennes, on the neck of a peninsula formed by the Meuse, 55 miles northeast of Rheims, on the Eastern Railway. It is connected by a bridge with Charleville on the opposite bank of the Meuse, which, together with Arches, Pierre and Mahon, forms practically one city with Mézières. It was formerly a fortified town but its forts were dismantled in 1886. It was successfully defended by Bayard against Emperor Charles in 1521, but was besieged and taken by the Germans in 1815 and in 1871. It fell into German hands early in the European War in 1914 and remained in the enemy's hands until after the signing of the armistice, 11 Nov. 1918. See WAR, EUROPEAN. Its parish church is a fine Gothic edifice dating from the 16th century. Together with Charleville it forms an important manufacturing centre in the metallurgical industries. Pop. about 10,403.

MEZÖTUR, mĕ'zō-tėr, Hungary, city in the County Jász-Nagykun-Szolnok, on the Berettyo, an affluent of the Tisza, 88 miles east of Budapest. It is situated in a rich agricultural district for which it furnishes a trade centre, and there are extensive communal pastoral lands upon which large herds of cattle are grazed. There are several large fairs held annually and the town has important potteries. Pop. 25,835.

MEZZA-MAJOLICA. See POTTERY MANUFACTURE.

MEZZANINE, *in architecture,* a low window occurring in attics and entresols. Sometimes applied to an entresol. A mezzanine story is a half story; one lower than the stories above and below. In theatres it is usually a floor between the stage and the bottom of the deep cellars of large theatres, from which floor the short scenes and traps are worked, the large scenes going down through openings into the cellar; hence the name, from being midway between the stage and cellar floor.

MEZZOFANTI, Giuseppe Gaspardo, joo-sĕp'pĕ gäs-pär'dō mĕd-zō-fän'tē, Italian linguist: b. Bologna, 17 Sept. 1774; d. Rome, 15 March 1849. He studied at the seminary of Bologna, and took priest's orders in 1797. He was appointed librarian and professor of Oriental languages at the university; in 1831 went to Rome, there succeeded Angelo Mai as keeper of the Vatican Library (1833), and in 1838 was made cardinal. It is said that he was familiar with over fifty languages, and even with the provincialisms of these various tongues. Byron called him «a monster of languages, the Briareus of parts of speech.» His library and his papers came into the possession of the University of Bologna. His attainments were not entirely limited to proficiency in languages, but only one printed work of his, a eulogy of Emmanuele da Ponte, a Spanish Jesuit who had taught him Greek, is in existence. Consult the ‘Lives’ by Russell (1858; 2d ed. 1863) and Bellesheim (1880); Manavit, ‘Esquisse Historique sur le Cardinal Mezzofanti’ (1854); ‘Quarterly Review,’ Vol. CI.

MEZZOTINT, met'sō-, a process of engraving on copper which dates from the 17th century. The smooth plate of the metal is abraded with a file-like tool, and tiny points are raised over the surface. These points catch and hold the ink, and an impression taken from a plate in this condition would give a soft velvety mass of black without variety of light and shade. A burnisher is next used to get rid of the raised points where half tones and lights are wanted. Sometimes where very brilliant high lights are required, they are cut away so as to ensure a smooth surface of copper. By means of this burnishing process, all gradations of light and shade are obtained from the white of the smooth copper to the black of the roughened plate. See ENGRAVINGS.

MHOW, m-how', India, town and British cantonment, in the Rajput state of Indore, 13 miles southwest of Indore. The town, situated on an eminence 1,800 feet high above the Gumber, is European in its appearance, having a church with a conspicuous steeple, a well-furnished library, a spacious lecture-room and a theatre. The cantonment is situated half a mile southeast of the town, and, in virtue of the Treaty of Mandsaur, is occupied by a considerable force. Mhow was one of the centres of the Sepoy mutiny of 1857. Pop. about 29,820.

MIACIDÆ, one of the most recent and most important families of creodonts, distinguished by a single pair of carnassial teeth, and by a larger brain-case and more advanced brain than other creodonts. The feet were five-toed, and spreading, and their claws were small, sharp and partly retractile. In general the structure was a composite of characters that seems to have led by specialization to the various families of fissipede carnivores of more modern times. This development becomes very apparent in the Carnivora of the Eocene, especially in the direction of the dog-type. It may be said that the Miacidæ represent the stock that in the Upper Eocene «passed imperceptibly into the Fissipedia, more obviously into the dog family,» which naturalists consider stands in the central line of fissipede development.

MIAGAO, mē-ā-gä'ō, Philippines, a pueblo of the province of Iloílo, Panay, on the southern coast of the island on Iloílo Strait, 22 miles west of Iloílo, the provincial capital. Pop. 20,656.

MIAKO, mē-ä'kō. See KIOTO.

MIALL, mī'ąl, **Edward,** English non-conformist politician: b. Portsmouth, 8 May 1809; d. Sevenoaks, Kent, 29 April 1881. He studied at Wymondley Theological Seminary, Hertfordshire; was pastor of independent chapels in Ware, 1831–34, and in Leicester, 1834–41; then removed to London, where he founded the *Nonconformist,* a weekly devoted to church disestablishment. From 1852–57 and again from 1869–74, he was a member of the House of Commons. He was one of the founders of the Liberation Society, and in 1858 was appointed to represent Non-conformity on the Education Commission. He urged the disestablishment of the Irish Church in 1856, and repeatedly moved for the formation of committee on English disestablishment. He was twice the recipient of valuable public testimonials. He wrote ‹The Nonconformist Sketch Book› (1845), ‹The British Churches in Relation to the British People› (1849), ‹Wayside Musings› (1865), and ‹Social Influences of the State Church› (1867). Consult the ‹Life› by his son Arthur (1867).

MIALL, Louis C., English naturalist: b. Bradford, 1842. He was made curator of the Leeds Literary Society in 1871 and professor of biology in the University of Leeds, 1876–1907 and was Fullerian professor of physiology the Royal Institution, 1904–05. He has written ‹Object Lessons from Nature› (1891); ‹Anatomy of the Indian Elephant› (1878); ‹Natural History of Aquatic Insects› (1895); ‹Round the Year› (1896); ‹Thirty Years of Teaching› (1897); ‹Injurious and Useful Insects› (1902); ‹House, Garden and Field› (1904); and ‹The Early Naturalists› (1912).

MIAMI, mī-äm'ē, Ariz., town in Gila County, in the Pina Mountains, 10 miles west of Globe and 60 miles east of Phœnix, on the Arizona Eastern Railway. The town owes its existence to the rich copper mines in its vicinity and dates from 1909, being incorporated in 1914. It is growing rapidly and the buildings are largely of concrete. Its light and power are supplied from the Roosevelt Dam, 40 miles to the northwest. Pop. (1920) 6,689.

MIAMI, Fla., town and county-seat of Dade County, at the mouth of Miami River on Biscayne Bay, and on the Florida East Coast Railroad. It has steamship connection with Havana, Nassau and San Juan. It is situated in an important citrus fruit and trucking district and is a shipping centre for great quantities of fruit and winter vegetables for the northern market. It has also a considerable fishing industry; and sponge fishing also is carried on in Biscayne Bay. The town dates from its selection as the southern terminal of the Florida East Coast Railway in 1896, at which time it was practically non-existent. The railroad was later extended to Key West, and the erection of the Royal Palm Hotel formed the inauguration of the town as a winter resort. The United States subtropical laboratory is located here, and it is the site of the now abandoned Fort Dallas, famous in the Seminole War. Pop. (1920) 29,549.

MIAMI, Okla., village and county-seat of Ottawa County, 16 miles southwest of Baxter Springs, Kan., on the Saint Louis and San Francisco, the Missouri, Oklahoma and Gulf, and the Oklahoma, Kansas and Missouri Interurban railroads. It is situated in a rich grain-growing district and there is a considerable industry in lumber, as well as the mining of lead and zinc. Pop. (1920) 6,802.

MIAMI, a river of Ohio, which rises in Hardin County and flowing south and southwest for a distance estimated at 150 miles, passing Troy, Dayton and Hamilton, enters the Ohio River at the southwest corner of the State, 20 miles west of Cincinnati. It is a rapid stream, passing through a picturesque and fertile country, and admits of navigation for only a portion of its length. Its principal branches are the West Branch, the Mad and the Whitewater rivers. The Miami Canal runs along the river for about 70 miles, and together they furnish extensive power for manufacturing purposes. This river is sometimes called the Great Miami, in distinction from the Little Miami, which rises in Madison County, and after a southwest course of about 100 miles, nearly parallel to the former, enters the Ohio six miles east of Cincinnati. It is skirted for the greater part of its course by the Little Miami Railroad, connecting Xenia and Cincinnati.

MIAMI INDIANS, an American tribe of the Algonquian family, and first known to French explorers in 1658 and then located near Green Bay, Wis. In 1700 they removed to Illinois, Indiana, and Ohio, and later separated into two distinct tribes Wea and Piankishaw. In the Colonial wars the Miamis figured with both combatants, but eventually joined Pontiac's alliance in 1764, opposing the Americans. After their defeat by General Wayne they signed a treaty at Greenville in 1795. They again joined the British against the Americans in 1812, fighting under Tecumseh (q.v.). In 1827 they sold most of their lands and removed to Kansas. Disease killed off the majority of them, and the remnant of the tribe located in Wabash County, Ind., until 1872, when they moved to the Quapaw Reserve in Indian Territory. In 1905 their numbers — which probably never at any time exceeded 1,700 — in Indian Territory were 124, and in Indiana 243, all of mixed blood.

MIAMI UNIVERSITY, in Oxford, Butler County, Ohio, is a coeducational institution. In 1788 J. C. Symmes purchased from the United States 1,000,000 acres of land, bounded south by the Ohio River, east by the Little Miami, and west by the Great Miami. One condition of this purchase was, that a full township, six miles square, should be set apart «for the endowment of an academy and other seminaries of learning.» This condition was not complied with; but as the prospect of the establishment of a university within the bounds of Symmes' purchase had induced many to settle there, in 1803 Congress ceded to the State of Ohio the township of Oxford, to be held in trust for educational purposes. The university was incorporated in 1809. The lands are leased for 99 years (renewable forever, without re-valuation), subject to an annual quitrent of 6 per cent on the purchase money. The government is vested in a board of 27 trustees appointed by the governor of the State, nine of whom retire every third year. A grammar school was established in 1818, and in November 1824 the college department proper was opened. The school has normal and college departments, the courses leading to the degrees of B.A. and B.S. In 1916 there were connected with the institution 55 professors and instructors and 789 students in the regular year, 1,154 in the summer school. The grounds and buildings were valued at $900,000. There were over 46,000 volumes in the library. The State aid amounted to about 205,652, and the total income from tuition, productive fund and State was $250,000. The first class, consisting of 12 members, was graduated in 1826.

MIAMISBURGH, mī-ăm'ĭz-bėrg, Ohio, city, in Montgomery County; on the Miami River and the Miami and Erie Canal, and on the Cleveland, Cincinnati, Chicago and Saint Louis and on the Cincinnati, Hamilton and Dayton railroads; about 45 miles north by east of Cincinnati. It is an agricultural region, where abundant water power has made it an important manufacturing place. It has large shipments of tobacco, manufactures and cereals. One of the largest Indian mounds in the State is just outside the city. In March 1913 the city suffered severely from a river flood, the damage being estimated at $1,500,000. Pop. about 4,300.

MIANABUG, a Persian tick of the genus *Argas,* greatly dreaded by travelers in former times; but its reputed powers of poisoning and otherwise harming humanity have been greatly exaggerated.

MIANTONOMOH, mĭ-ăn-tō-nō'mō, an American Indian chief, a sachem of the Narragansetts, who succeeded his uncle, Canonicus, in 1636. In 1637 he assisted the early settlers of Massachusetts in the Pequot War. In 1643 he attacked Uncas, his bitter rival, was captured and turned over to the commissioners of the United Colonies at Boston. He was placed on trial before an ecclesiastical court, found guilty, condemned to death, and Uncas was commissioned to carry out the sentence. A brother of Uncas, however, assassinated the captive before the sentence could be executed. He was buried where he fell, and a monument was erected over the spot in 1841.

MIAO-TSE, mē-ä'ō-tsĕ, or **MIAU-TSI,** general name of numerous aboriginal Chinese tribes dwelling in the provinces of Yunnan, Kweichow, Hunan, Kwangsi and Kwangtung, China. They are hillmen and number some 80 tribes, with a population running into millions, although their numbers are decreasing. While nominally under Chinese rule they are practically independent, maintaining their own government, customs and dress; the authority of the Empire extending only so far as to keep them within the hill districts and prevent their attacking their neighbors. They speak several dialects and the customs of the different tribes vary considerably. The last serious uprising was in 1832, since when they have in the main kept to themselves. They are of low stature and more angular in feature than the Chinese, and somewhat darker of complexion. Consult Bridgman, E. C., 'Sketches of the Miau-tsi'; Williams, S. W., 'The Middle Kingdom' (1883); Edkins, 'The Miau-tsi Tribes' (1870); Boulger, D. C., 'The History of China' (1898).

MIAS. See ORANG-UTAN.

MIASMA, or **MIASM** (Gr., «pollution»), an ancient term, now obsolete, which meant a disease-producing emanation in the atmosphere, from decaying animal or vegetable material; malaria; malarial poison. Diseases at one time supposed to be thereby produced were classified as miasmata — such as intermittent and remittent fever, typhus and typhoid fever. The term is used infrequently at the present day, as micro-organisms (bacteria-germs) are believed to be responsible for the spread of most of these diseases, and do not exist in the form of a miasm. While some of these organisms are carried by the atmosphere, and are inhaled, others are conveyed by insects to articles of food, and are taken into the body when such food is eaten. Others, still, are elaborated in a kind of mosquito (*Anopheles*) and injected into the blood.

MIASSKY ZAVOD, mē-ąs'kē zą-vōd, or **MIAS, MIYASS,** or **MIYASK,** eastern Russia, city in the government of Orenburg, in the Ural Mountains, 35 miles west of Cheliabinsk, near the Trans-Siberian Railway. It has important gold mines. Pop. 25,479.

MIAULIS, mē-ow'lēs, **Andreas Vohos, or Bokos,** Greek admiral: b. Negropont, about 1768; d. Athens, 24 June 1835. His family name was Vokos or Bokos, his surname Miaulis being derived from the Turkish word for a felucca. He was a wealthy merchant captain living on the Island of Hydra at the outbreak of the Greek war of independence in 1821, and was appointed to the command of the Greek fleet. He assisted at the relief of besieged Missolonghi in 1822–23, and succeeded in blocking the Turks' further advances after their capture of Psara in 1824. He was able to supply troops and stores to Missolonghi in the second siege of 1825, although he could not prevent the fall of the town. He was outnumbered by the Egyptian naval forces, but succeeded in hampering their movements. He was superseded in the command of the Greek naval forces by Lord Dundonald in 1827, and thereafter ably supported his successor, the representative of the powers intervening in behalf of Greece. After the establishment of Greek independence he was a vigorous antagonist of Capodistrias and the Russian party, and again commanded the fleet in the insurrection of 1831. He was one of the deputation commissioned to offer the Greek crown to King Otho, and he remained his staunch supporter. He was named by King Otho rear-admiral, and later, vice-admiral.

MICA (Lat. *mico,* flash), a mineral group, marked by high basal cleavage, and laminæ which may be made very thin by a process of continued separation. The micas are silicates; muscovite, the commonest, is a silicate of potassium and aluminum, and is often styled potassium mica; paragonite, or sodium mica, corresponds closely to muscovite, but has sodium instead of potassium; biotite, a silicate of magnesium, potassium and iron, is marked by its darker tints, and is commonly called magnesium iron mica; lepidolite is a lithium mica, with fluorine, potassium and aluminum in its composition, and a rose tint. Mica is widely scattered in North America and Asia, especially India. Ruby colored mica, no matter what its provenance, is now called «Indian.» Europe has no commercial supply. Deposits are most frequently found in pegmatite (q.v.) dikes, varying in thickness from a few inches to several hundred feet, and correspondingly in length. Many other minerals accompany it, especially quartz and feldspar, and the mica is scattered through the dike, or vein, as the miners call it. Moreover, scarcely more than 10 per cent, and sometimes as little as 2 per cent, is commercially useful. Mica was well known in prehistoric America, traces of its use being widespread. A great shaft near Mount Mitchell, in North Carolina, was discovered in 1869. This not merely solved the question as to the origin of the early supply, but gave the first impulse to the mining of mica in the United States. Mica lands in North Carolina became tremendously valuable. This boom was quickly followed by the development of the industry in southern New Hampshire; and this in turn by important discoveries, in the 80's, in Canada and India. In Quebec, Ottawa and Perth and Renfrew counties, Ontario, the supply is of excellent quality, and hence is easily mined and cheap. Hindu labor and an excellent grade of mica make the output of Bengal, Bombay and the Madras presidency even cheaper. To classify the various sources of supply roughly, it may be said that India gives the world one-half, and Canada and the United States each about one-fourth of the entire supply. Everywhere the «veins» start near the surface; hence mining is simple. In New Hampshire there has been a break from the primitive methods, but in North Carolina, apparently the richest field in the United States, the mining is still unorganized, being done almost entirely by farmers, with the simplest of tools, between crops. In this region, mica is largely used as a medium of exchange between farmers and storekeepers.

In 1870 mica waste was first utilized by Frederick Beck, who introduced the use of «mica-flour,» or ground mica, as a coating for cheap wall-papers. Scrap-mica, formerly worthless, rose to $17 a ton, and then gradually fell to $6 or $7. This branch of the business is confined to the United States. Since 1895 there has been a fresh and most important use for mica, namely, as an insulator. For this purpose the sheets are split very thin and glued to cloth, then wound into rings for armatures. As a result of this variation of the uses of mica, only the colorless sorts, notably muscovite, are largely used for lamp chimneys and stove doors. Mica is also valuable as a lubricant, as an absorbent of glycerine in making dynamite, and, in the case of the lithium silicates, such as lepidolite, in the manufacture of lithium salts. See MINERAL PRODUCTION OF THE UNITED STATES.

MICA SCHIST, shĭst, a schistose rock, metamorphic in nature, containing mica and quartz. The origin of most of the mica schists is uncertain; the sericite variety seems to be the result of mountain-building forces acting upon igneous rocks; other sorts are almost as certainly due to the same force acting upon sedimentary rocks. Mica occurring in schist is usually muscovite, that is, the colorless sort; biotite, or dark mica, is less frequent. Various embedded minerals occur, notably garnets.

MICAH, mī'ką, the sixth of the minor prophets, dwelt in Moresheth, a little town, once a dependency of the Philistine city of Gath, but by the conquests of Uzziah reduced with the whole of western Judah, including the city of Gath, to Hebrew domination. His main public work was accomplished during the reign of Hezekiah. He dwelt on the great international highway between Egypt and Assyria and was led to take a wide view of the political movements in Western Asia in their effect upon his own people. He lived in the 8th century B.C. and he witnessed the ending of the northern kingdom, and the invasion of Palestine by Sargon and Sennacherib. He witnessed also the corruption of morals which Hezekiah only partially corrected. His prophecy is directed against Samaria and Jerusalem, whose sufferings for their sins and irreligion he declares shall be greater than those of Babylon and the other Gentile cities. His style is pure and correct, his images bold, his denunciations full of strength and severity.

MICAH, Book of. The title of the book, i, 1, describes it as «the word of Yahweh that came to Micah the Morashtite in the days of Jotham, Ahaz, and Hezekiah, kings of Judah.» In Jeremiah xxvi, 18, is a quotation from the words of the elders: «Micah the Morashtite prophesied in the days of Hezekiah king of Judah.» The chronology of this period is somewhat uncertain. The probable dates, however, are Jotham, 740–736; Ahaz, 736–727; Hezekiah, 727–695. The title, like most similar titles, is doubtless a later editorial addition. Hence the evidence indicates most definitely the activity of Micah during the reign of Hezekiah. The most probable period is shortly before the capture of Samaria, i, 5–6, perhaps about 724 B.C., although this might refer to a later period, inasmuch as Samaria was not entirely destroyed at that time and, according to the Assyrian records, was active again not long after that event.

It is now quite generally agreed that Micah was not the author of the whole of the book. But there is much difference of opinion concerning the details of authorship. The most of chapters i–iii is a unity, with the exception principally of ii, 12–13, and was doubtless written by Micah. This is throughout a message of condemnation with a prediction of punishment upon Judah, and to a minor degree upon Israel, for their sins. The remainder of the book contains some portions of a tenor similar to this, but consists for the most part of messages of blessing and restoration. There are two parts, chapters iv–v, and vi–vii. It seems reasonably certain that Micah was not the author of all of iv–vii, especially because of obvious inconsistencies, both within these chapters and as compared with i–iii: v, 2–4, e.g., is out of harmony with v, 5–6; iv, 11–13 is inconsistent with iii, 12. The connection of thought in iv–vii is not close so that evidently either the original order has been changed, or it was originally a composite of miscellaneous portions. The following portions in iv–vii are similar, as messages of punishment, to i–iii, and were probably written by Micah: v, 1, 10–13; vi, 9–16; vii, 1–6. Most of the remainder of iv–vii together with ii, 12–13 contains messages of hope and restoration after disaster. It is a possibility that most of this may have been written by Micah. But, if so, it must have been at a different period, presumably much later, as Isaiah probably gave some messages that were distinctly of hope at the latter end of his ministry. The strong probability remains, however, that these portions were not written by Micah but consist of various later fragments, mostly of the time of the exile and after the exile. The change of tone is less probable for Micah than for Isaiah, because Micah's original message had in it no real hope, while that of Isaiah did, at least from an early period in his ministry.

Micah is described as the Morashtite, meaning probaby an inhabitant of Moresheth-gath, Micah i, 14. This place is not mentioned outside of this verse. It probably was a town named Moresheth, a dependency of the well-known Philistine city Gath. He was thus of the country, and shows a corresponding type of message, differing markedly from that of his contemporary Isaiah who was a city-dweller, an inhabitant of Jerusalem. Micah's denunciation of the sins of the people and threats of punishment are similar to those of Amos. His most characteristic specific addition to the prophetic message is the prediction, first given by him, that Jerusalem shall be destroyed for the sins of the people, iii, 12. The later additions to Micah for the most part contain no specially notable message. vi, 6–8 give, however, a clear statement of the high prophetic ideal of life.

Bibliography.— Cheyne, T. K., 'Book of Micah' ('Cambridge Bible,' 2d ed., Cambridge 1895); Smith, G. A., 'The Book of the Twelve Prophets' ('Expositor's Bible,' Vol. I, New York 1896); Smith, J. M. P., 'Micah' ('International Critical Commentary,' New York 1911).

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MICAH CLARKE, a novel by Sir Arthur Conan Doyle, published in 1888. It presents in the form of fiction a graphic and vivid picture of the political condition in England during the Monmouth Rebellion (1685).

MICAWBER, mĭ-kâ'bėr, **Mr. Wilkins,** a shiftless, unsuccessful optimist, always in trouble, but always sure «something will turn up,» one of the secondary characters in Dickens' 'David Copperfield' (1849). He is a portrait of the novelist's father, not only in character but in the principal incidents in his career, and Mrs. Micawber, who has great faith in her husband, was patterned after Dickens' mother.

MICELLAR THEORY, *in botany,* the theory, proposed in 1862 by the Swiss botanist K. W. Nageli (q.v.), that the accretion of starch-grains and similar bodies within cells in a living plant, and the formation and growth of the walls of cells, was by means of molecules, each an aggregation of lesser molecules, to which he gave the name *micellæ.* They are invisible to even the highest powers of a microscope. Two or more having united, the growth of the grain to be composed, or the cell-wall to be broadened, is accomplished by more micellæ crowding into crevices between those already in place. Some important plant-physiologists have always refused to accept this hypothesis, which is now generally distrusted.

MICHAEL, mī'kĕl or mī'kā-ĕl (Hebrew, «who is Godlike»), is spoken of in Daniel (x, 13, 21; xii, 1) as one of the «chief princes,» and the «great prince.» In Jude (verse 9) he is called the archangel who disputed with the devil about the body of Moses. In the Revelation (xii, 7) it is said «there was war in heaven: Michael and his angels fought against the dragon.» From this expression it has been inferred that he was the chief of the celestial hierarchy. Milton calls him «of celestial armies prince,» and «prince of angels,» and attributes to him the command of the heavenly forces. He was ranked by Thomas Aquinas, followed by Dante, as the first of the seven archangels, a character in which he first appears in the Ethiopian Enoch, in which he is represented as executing the commands of God at Judgment Day, or presenting the prayers of the saints before the throne of God. In France especially churches dedicated to this saint, whose day in the Western Church is 29 September, are often built on the loftiest hill tops, to afford the warrior angel a vantage ground in warring against the evil «powers of the air» and driving off plague, drought and murrain.

MICHAEL I, RHANGABE, or **RHAGABE,** Byzantine emperor: d. about 845. He succeeded Stauracius in 811 and after carrying on war with the Bulgarians was deposed in 813 by Leo V, an Armenian general in his service, and spent the rest of his life in a convent.

MICHAEL II Balbus (THE STAMMERER), Byzantine emperor: d. 829. He came of an obscure Phrygian family, but was ennobled by Leo V. The latter, however, suspecting Michael of conspiracy against him, ordered the Phrygian to be put to death. Michael saved himself by the assassination of Leo and became emperor in 820. During his reign Sicily and Crete were lost to the Western empire.

MICHAEL III (THE DRUNKARD), Byzantine emperor: d. 867. He was a grandson of Michael II, and in 842 succeeded his father, Theophilus, though his mother Theodora continued regent till 856. With his uncle, Bardas, he made an expedition against the Bulgarians in 861 and converted the king of Bulgaria. In 866 he associated Basilius the Macedonian with himself in the government and was assassinated by him the next year.

MICHAEL IV (THE PAPHLAGONIAN), Byzantine emperor: d. 1041. He received his surname from the place of his nativity, and became chamberlain to Zöe, wife of the Emperor Romanus III. On the death of Romanus in 1034 he became emperor and the husband of Zöe, who is presumed to have murdered Romanus because of her love for Michael.

MICHAEL V, Calaphates (THE CALKER), Byzantine emperor. He was a nephew of Michael IV, whom he succeeded on the throne. His banishment of the Empress Zöe led to a revolt in Constantinople, in which he was overthrown and compelled to retire to a convent.

MICHAEL VI (THE WARRIOR), Byzantine emperor. He succeeded the Empress Theodora in 1056, but after the expiration of a year was deposed by Isaac Comnenus and spent the rest of his life in a convent. He was the last of the Macedonian dynasty.

MICHAEL VII, Ducas or **Parapinaces,** Byzantine emperor. He was the son of Constantine XI, and came to the throne in 1071. He was a weak monarch, the prey of unscrupulous favorites, and an insurrection in 1078 drove him from the throne and into a monastery.

MICHAEL VIII, Palæologus, Byzantine emperor: b. 1234; d. 1282. After having commanded the French mercenaries employed by the emperor of Nicæa he became one of the guardians of the Emperor John Lascaris in 1259. The next year he was proclaimed joint emperor of Nicæa in 1260, and the next year, after deposing his colleague Lascaris, became sole monarch. In the same year he wrested Constantinople from the Latins and was shortly afterward crowned emperor of the Byzantine empire. He made an unsuccessful attempt to effect the union of the Western and Eastern Churches.

MICHAEL IX, Palæologus, Byzantine emperor: d. 1320. He was the son of Andronicus II, with whom he was associated in the government after 1295, but died before his father.

MICHAEL, Tsar of Russia. See ROMANOFF.

MICHAEL, Arthur, American chemist: b. Buffalo, N. Y., 7 Aug. 1853. He was educated at the universities of Berlin and Heidelberg, and at the École de Médécine de Paris. He was professor of chemistry at Tufts College in 1882–89 and in 1894–1907, and was professor emeritus there in 1907–12. Since 1912 he has been professor of organic chemistry at Harvard University. He is a member of the National Academy of Sciences. He has made extensive researches in pure chemistry and published reports of his investigations in the ‹Proceedings› of the National Academy of Sciences; the *American Chemical Journal;* and the ‹Berichte der deutschen hemischen Gesellschaft.›

MICHAEL, Attaliates, Byzantine jurist: lived in 11th century. He wrote a history of the years 1034–79; and published a succinct and methodic abridgment of the Basilicæ (1073).

MICHAEL, a pastoral narrative in 482 lines of blank verse, by William Wordsworth, was composed and published in 1800. In a letter to Fox, 14 Jan. 1801, Wordsworth writes: «In the two poems, ‹The Brothers› and ‹Michael,› I have attempted to draw a picture of the domestic affections, as I know they exist among a class of men who are now almost confined to the north of England. They are small independent proprietors of land, here called statesmen, men of respectable education, who daily labor on their little properties . . . Their little tract of land serves as a rallying-point for their domestic feelings, as a tablet upon which they are written, which makes them objects of memory in a thousand instances, when they would otherwise be forgotten.» The theme of Michael, as suggested in Wordsworth's letter, has two phases: the love of a «statesman» for his little landed property in the hills, and of a father for his son. The story of the poem is founded upon fact. To Michael and his wife in their old age is born a son, Luke, whom his father cherishes both as a companion and as his heir. When Luke is 18 years old, Michael, through the fault of another, loses a portion of his property. Luke must go to the city and there earn enough to redeem the land. Before the boy leaves, he lays the corner-stone of the sheepfold which he and his father were to build together, now left for the old man to build alone. Far away in the city, Luke is finally led away by bad companions and is heard from no more. The old father's heart is broken; the sheepfold, symbol of his faith and love, is never finished.

‹Michael› is an illustration of Wordsworth's theory that the emotions find their best soil in common life, where they «are incorporated with the beautiful and permanent forms of nature.» Michael himself is perhaps Wordsworth's ideal man, and, possibly because he was the type best known to the poet, is more clearly portrayed and more highly individualized than any other of Wordsworth's characters. He has the ruggedness, strength and majesty of the Westmoreland hills among which he lives. The setting, the characters and the story of the poem are too interdependent, too integrally fused, to be separately analyzed. The style, classical in its simplicity and restraint, and stripped of all extraneous ornament almost to severity, is merely a crystal medium through which appears the essential poetry of the subject. The magical suggestiveness of such lines as

"Hence had he learned the meaning of all winds,"

and

"...... he had been alone
"Amid the heart of many thousand mists,"

are far surpassed both in suggestiveness and essential poetry by the simple passage which states that the old broken-hearted father often tried to complete the sheepfold, and that

"many and many a time he thither went
"And never lifted up a single stone."

Marion Tucker.

MICHAEL AND HIS LOST ANGEL. Mr. Henry Arthur Jones during his long career as a playwright wrote more than half a hundred plays which may be roughly divided into three categories,— melodramas, comedies of manners and serious plays. Of the latter group ‹Michael and His Lost Angel› is generally regarded by writers on modern drama as the most notable. This consensus of opinion is the more interesting in view of the fact that although on 15 Jan. 1896 the play received the rare distinction of a simultaneous production in London and New York, with Forbes-Robertson and Marion Terry in the principal rôles in London and Henry Miller and Viola Allen in New York, it failed in both places, was withdrawn in its second week and has never been revived. The two chief characters are familiar ones on the stage and especial favorites with Jones, namely, the priestly ascetic and the worldly siren. The opening scene is thoroughly effective. Michael Feversham, an austere young clergyman, has forced the erring daughter of his secretary to public confession of her sin in the church before all the townspeople. When Audrie Lesden, a mysterious and charming new parishioner, presently appears on the scene, we are left in no doubt from the moment of her entrance that she is the temptress; her tempting, indeed, is so obvious, the fall of Michael so predestined, and the expiation of his guilt by public confession so plainly foreshadowed in the first scene, that there are no surprises. A more serious defect is that the author fails to enlist the sympathy of his audience for either of his main characters. Michael remains a «holier than thou» prig with what the Freudians would call an «impurity complex,» and Audrie is so patently selfish and frivolous that only an actress of very great personal charm could make Michael's infatuation convincing.

MICHAEL KOHLHAAS. This story by Heinrich von Kleist was published as the first of his *Erzählungen*, «Stories» (1810), after a fragment of the story had been issued in a periodical, *Phœbus*, two years before. Michael Kohlhaas, an upright and highly respected horse-dealer, is wantonly wronged by a young nobleman; after fruitless efforts to obtain justice from the legally constituted authorities, he resolves to take matters into his own hands, even in rebellion against the social order which has failed to afford him protection. With pathetic obstinacy he still insists upon the simple terms of his original claim, even after the forces which he has gathered about him have engaged in a kind of civil war. Ultimately he gains his contention, recompense for his loss and the punishment of the privileged offender, but he himself suffers death as a penalty for crimes committed while seeking justice in his own way. The outlines of the story Kleist took from the career of Hans Kohlhase (executed in 1540), which was probably familiar to him both by oral tradition and through the chronicles of Hafftitz and Leutinger. But Kleist used the artist's prerogative and altered the material at will, creating the characters anew, and supplying the substance with an ethical problem. Through a sense of personal wrong, following his own conception of justice, a man of spotless integrity becomes a criminal and an outlaw. The problem of so-called folk-justice, which is here illustrated, has been notably treated elsewhere in German literature, conspicuously in Ludwig's ‹Erbförster.› Kleist followed his historical source in introducing Martin Luther into the story of his hero, and presents a firmly drawn portrait of the German reformer. The story is a masterpiece of narrative skill; it is all narrative, without description of people or of places, without comment or sentiment; it moves forward with the simplicity of a chronicle, one event following another in tragic and inevitable succession. ‹Michael Kohlhaas› is one of the most powerful stories in the whole range of German fiction. It was translated into English by Frances H. King in ‹The German Classics› (Vol. IV).

Harvey W. Thayer.

MICHAEL OBRENOVITCH III, ō-brĕn'-ō-vĭch, Prince of Serbia: b. Kragujevatz, 4 Sept. 1823; d. near Belgrade, 29 May 1868. He was the youngest son of Prince Milosh, and after the abdication of his father, in 1839, and the death of his brother Milan Obrenovitch II, in 1840, he succeeded to the throne of Serbia. His effort to continue the policy of his father, which was to free Serbia and the Christian peoples of the Balkans generally from Turkish rule, met with the support of Russia and the determined opposition of Turkey and Austria, together with that of the party which had deposed his father. A revolt in 1842 resulted in the election of Alexander Karageorgevich as Prince of Serbia, and Prince Michael was forced to leave the country. In 1858 his father, Prince Milosh Obrenovitch II, was recalled to the throne and upon his death in 1860 Michael succeeded him. He at once set about securing the emancipation of Serbia's internal affairs from Turkish domination, secured an understanding with Montenegro, Greece, Austria and the Bulgarian, Bosnian and Albanian leaders for either support or non-intervention in case of war with Turkey, and demanded the withdrawal of Turkish troops from Serbian fortresses. He was supported in his demands by the influence of Great Britain, Russia and Austria, and Turkey yielded, the forts being surrendered 26 April 1867. He largely reorganized the administration of public affairs, strengthened the military organization, and placed his country in the ranks of civilized European states. A plot against him was organized by the followers of the deposed Karageorgevich dynasty and resulted in his assassination. He was succeeded by a cousin, Michael Obrenovitch IV.

MICHAELIS, mē-kạ-ā'lĭs, **Adolf**, German archæologist: b. Kiel, 22 June 1835; d. Strassburg, 10 Aug. 1910. He was educated at the universities of Berlin, Leipzig and Kiel, and in 1862 became professor at Griefswald. He was appointed professor of classical philology and archæology at Tübingen in 1865, and from 1872 he was professor of archæology at Strassburg. He became a member of the German Central Archæological Institute at Rome in 1874 and published a history of its activities (Berlin 1879). He edited O. Jahn's ‘Bilderchroniken’ (1873) and Springer's ‘Handbuch der Kunstgeschichte’ (1898, 1901, 1904, 1907). His chief publication was his critical edition of Tacitus' ‘Dialogus de Oratoribus’ (1868). He was also author of the archæological treatises ‘Der Parthenon’ (1871); ‘Ancient Marbles in Great Britain’ (trans. by Fennell, 1882); ‘Strassburger Antiken’ (1901); ‘A Centry of Archæological Discoveries’ (trans. by Kahnweiler, 1908), etc.

MICHAELIS, Georg, German statesman: b. 1857. After entering the civil service he acted as a teacher in the German school at Tokio from 1885 to 1889. On his return to Germany he served in various provincial posts as a state attorney. He was appointed director of the Churches and Schools Administration in 1897 and after a period of office in Breslau he became under-secretary in the Prussian ministry of finance. Early in the European War Herr Michaelis, while retaining his post in the ministry, was selected as director of the «War Corn Office,» one of the first establishments set up to deal with the food problem. On the fall of Bethmann-Hollweg in July 1917 Dr. Michaelis, then an almost unknown bureaucrat, was appointed Imperial Chancellor by the Kaiser. The appointment occasioned much surprise and speculation; the only one of the eight imperial chancellors of the German Empire from Bismarck to the end of the European War who was not a member of the nobility, Dr. Michaelis was destined to a short and inglorious tenure of that high office. After little more than three months he was dismissed. The charges against him were somewhat obscure and can only be described as a general accusation of incompetence — inability to procure peace or to satisfy any political party in Germany. The Socialist organ, *Vorwärts*, declared that «the remaining of this man in office constitutes a paralysis of all political functions of the empire abroad and at home.» Count Hertling (q.v.) was appointed Chancellor on 1 Nov. 1917 and Michaelis retired from the stage decorated with the Chain of the Grand Cross of the Red Eagle.

MICHAELIS, Johann David, yō'hän dä'vēd mē'hä-ā'lĭs, German biblical scholar: b. Halle, Prussia, 27 Feb. 1717; d. Göttingen, 22 Aug. 1791. He studied at the University of Halle, traveled in Great Britain and Holland, became professor of philosophy at Göttingen in 1746, and professor of Oriental languages there in 1750. He was one of the editors (1753–70) of the *Göttingen gelehrte Anzeigen*, and served for a time as librarian to the university. Modern biblical criticism in Germany sees in Michaelis one of its forerunners, whose works are of interest in the history of its development. They include his ‘Hebräische Grammatik’ (1778); ‘Einleitung in die göttlichen Schriften des neuen Bundes’; ‘Mosaisches Recht’; ‘Moral’ (1792–1823); ‘Orientalische und exegetische Bibliothek’ (1786–93). Consult his ‘Lebensbeschreibung von ihm selbst abgefasst,’ ed. by Hassencamp (1793), and his letters (1794–96). Consult the ‘Life’ by Smend (1896).

MICHAËLIS, Karin (MRS. CHARLES EMIL STANGELAND), Danish author: b. Randers, 20 March 1872. Her maiden name was Beck-Bröndum, and she was married in 1895 to Sophus Michaëlis (q.v.), from whom she later separated. She was married to Charles Emil Stangeland, an American, in 1912. Author of ‘Hoit Spil’ (1898); ‘Hellig Enfold’ (1903); ‘Den Farlige Alder’ (1910); ‘Grev Sylvanus Hœvn’ (1911).

MICHAËLIS, Karoline. See VASCONCELLOS, KAROLINE MICHAËLIS.

MICHAËLIS, mĭ-kȧ-ā'lĭs, **Sophus**, Danish author: b. Odense, 14 May 1865. He was educated at the University of Copenhagen and afterward engaged in extensive foreign travel. He is known as a novelist, poet and dramatist, and also made translations of Flaubert's ‘Salammbô’; ‘Sucassin et Nicollete’; and ‘Tentation de Saint Antoine.’ He edited *Kunst* in 1900–06. Author of ‘Solblomster’ verse (1893); ‘Æbelo,’ romance (1895); ‘Livets Fest’ (1900); ‘Palmerne’ (1904); the novels ‘Dödedansen’ (1900); ‘Giovanna’ (1901); and the dramas ‘Revolutionsbryllup’ (1906); ‘Den Evige Sövn’ (1912), etc.

MICHAELIUS, mē-kā'lē-oos, **Jonas**, first Dutch Reformed minister in America: b. in the north of Holland, 1577; d. Holland, after 1637. He studied at Leyden, had a country church in Holland from 1612 to 1616; was sent to San Salvador, Brazil, in 1624; was transferred thence to Guinea in 1626; and in 1628 went to Manhattan, where he organized a consistory after the Dutch Reformed government, remaining probably until 1633. His last years were spent in Holland. A letter written by him in 1628, and now preserved in the New York Public Library, describes the condition of the New York Indians, urging work among the children; it is published in the New York Historical Society's ‘Collections’ (1880).

MICHAELMAS, mĭk'el-mạs, the feast of Saint Michael and All Angels, 29 September. The festival was first appointed by Pope Felix III, 480. In the Greek Church it did not originate earlier than the 12th century. It was an old custom in England to mark the day by electing civil magistrates, perhaps in allusion to the analogy between the superintendence of magistrates and that of guardian angels, of whom Saint Michael was reported the prince. A more famous custom is that of eating roast goose, the origin of which has long exercised the wisdom of antiquaries. The traditional Michaelmas goose has been traced at least as far back as the 10th year of Edward IV; and it is said that one of the strongest objections of the English commonalty to the reformation of the calendar was based on the confusion which would follow if Michaelmas day was not celebrated when stubble geese are in their highest perfection. There is an old proverb «If you eat goose on Michaelmas day, you will never want money all the year round.» Consult Chambers's ‹Book of Days.›

MICHAL, wife of King David and younger daughter of King Saul. After David was driven away from court and his life saved by Michal, who favored his escape, her father married her to Phalti, from whom David eventually recovered her, but was permanently alienated from her by her levity and want of sympathy with his enthusiastic joy over the return of the ark to Jerusalem.

MICHALOWSKI BLASTING POWDER. See EXPLOSIVES.

MICHAUD, Joseph François, zhō-zĕf fräṅ-swä, French historian: b. Albens, Savoy, 19 June 1767; d. Passy, 30 Sept. 1839. He became a journalist at Paris, where he wrote for Royalist papers and stoutly upheld the monarchy; and in 1794 established the *Quotidienne.* His opposition to the Revolution brought upon him sentence of death (27 Oct. 1795), and though the sentence was later revoked, he was finally exiled by the Directory and went into hiding in the Juras. He was allowed to return under the consulate, but remained an apologist of the Bourbons, and at the Restoration took up the publication of the *Quotidienne.* The well-known ‹Biographie moderne› was published under his direction and part of the ‹Biographie universelle› He was elected to the Academy in 1823. Among his more important works are ‹Histoire de l'Empire de Mysore› (1801); ‹Histoire de Croisades› (1812–22); ‹Dernier règne de Buonaparte› (1815); and ‹Collection de mémoires pour servir à l'histoire de France depuis le XIIIme Siècle› (1836–39).

MICHAUT, mē-shō, **Gustave Marie Abel,** French literary critic and educator: b. Perrigny, 20 Feb. 1870. He was educated at the École Normale Supérieuer, was professor at the University of Fribourg, Switzerland, in 1894–1904, and has since been lecturer at the University of Paris. He lectured in the United States in 1911. He was laureate of the French Academy in 1896, 1901, 1903, 1907. Author of ‹Edition des Pensées de Pascal› (1896); ‹Des Discours sur le passions de l'amour de B. Pascal› (1900); ‹Les Pensées Marc-Aurèle (1901); ‹Etude sur le livre d'amour de Sainte-Beuve (1905); ‹De la poésie française júsqu 'au regne Henri quatrieme› (1908); ‹Honoré d'Urfé,› poems (1909); ‹Pages de critique et d' histoire litteraire› (1910); ‹Anatole France; etude psychologique› (1914), etc.

MICHAUX, André, äṅ-drā mē-shō, French botanist: b. Satory, Versailles, 7 March 1746; d. Madagascar, 16 Nov. 1802. His father, a rich farmer, took him into partnership, but the death of his wife soon after their marriage drove him to the study of botany and to travel. He traveled through France and England in 1779–81; then through Persia and to the borders of Tibet (1782–85); and in 1785 to North America, where he made an exhaustive study of the flora of the Atlantic Coast, and near Charleston, S. C., and in Bergen County, N. J., established large nurseries. In 1800 he set out to investigate the flora of Madagascar, where he died. He wrote a ‹History of the Oaks of North America› (1801) and ‹Flora Boreali-Americana› (1803).

MICHAUX, François André, French botanist: son of André Michaux (q.v.): b. Versailles, 1770; d. Vauréal, 23 Oct. 1855. He was his father's assistant, and in 1802 and 1806 was sent to North America by the French government. He wrote a ‹Journal› of his travels, translated into English (1805); ‹The Naturalization of American Forest Trees› (1805); and the important ‹North American Sylva› (3 vols., 1810–13), translated by Hillhouse (1817–19) and completed, for western America, by Nuttall (1842–50).

MICHEL, mē'shĕl', **Claude (Clodion),** French sculptor: b. Nancy, 20 Dec. 1738; d. Paris, 29 March 1814. He went to Paris in 1755 and studied sculpture under his uncle, Lambert Sigisbert Adam, and later under Pigalle. He was awarded the grand prize for sculpture at the Académie Royale in 1759, and in 1761 the first silver medal for studies from life. He lived in Rome in 1762–71, studying and working, the years 1767–71 being especially productive. He was invited to Petrograd by Catherine II, his fame being widespread by this time, but eventually decided upon his return to Paris. He rapidly gained a large patronage, executing orders for the Chapter of Rouen, the Direction Générale and the States of Languedoc. His work ranged from serious groups and statues of splendid line and noble conception, to delicate statuettes, usually of terra cotta, and portraying cupids, fauns, nymphs and similar subjects. During the Revolution he returned to his birthplace, Nancy, where most of his time until 1798 was spent in modeling decorations for houses. He is perhaps best known for his statuettes, which are treasured in both private and public collections. Among his work may be mentioned the statue of Montesquieu; the ‹Dying Cleopatra›; ‹Vestal Crowned with Flowers›; a mantelpiece in the South Kensington Museum; and the statue and relief of Saint Cecelia in the Cathedral at Rouen. In New York his work is represented at the Metropolitan Museum by statuettes in the Morgan and Altman collections. Consult Thirion, ‹Les Adam et Clodion› (1885); Jacquot, ‹Les Adam et les Michel et Clodion› (1898).

MICHEL, Dan (Dominus or Master), or **MICHEL OF NORTHGATE,** English translator and brother in the cloister of Saint Augustine of Canterbury: lived 1340. He is known only through his translation of a French moral treatise written in 1279 by Frère Laurens (Latin name Laurentius Gallus), for Philip III, of France. The French manuscript is entitled ‹Le Somme des Vices et des vertus›; and Dan Michel's translation into the Kentish dialect is known as ‹The Syenbite of Inwit,› i.e., ‹The Again-biting of the Inner Wit,› or ‹The Remorse of Conscience.› The manuscript is autographed by Dan Michel and dated 1340. It is preserved in the Arundel manuscript 57, and is of high philological value as an authentic and dated specimen of the Kent dialect of the 14th century. Consult editions by Stevenson for the Roxburghe Club (1855); Morris for the Early English Text Society (1876).

MICHEL, Francisque Xavier, French archæologist: b. Lyons, 18 Jan. 1809; d. Paris, 18 May 1887. He was educated at Lyons and became known for his work in editing French manuscripts of the Middle Ages. He was sent to England in 1833 and to Scotland in 1837 for the purpose of making researches for the French government. He was appointed professor of foreign literature at the Faculté des lettres at Bordeaux in 1839. He edited numerous manuscripts written between the 11th and 14th centuries, among them ‘Chanson de Roland’ and ‘Roman de la Rose.’ He later translated into French many works of Goldsmith, Shakespeare, Sterne and Tennyson; and he was author of ‘Histoire des races naudites de la France et de l'Espagne’ (2 vols., 1847); ‘Recherches sur le Commerce pendant le moyen-âge’ (2 vols., 1852–54); ‘Etudes de Philologie comparée sur l'argot’ (1856); ‘Histoire du commerce et de la navigation á Bordeaux’ (2 vols., 1867–71), etc.

MICHEL, François Emile, fräṅ-swä ā-mēl mē-shĕl, French painter and art critic: b. Metz, 19 July 1828; d. 24 May 1909. After studying under Migette and Marechal, he made his début in the Salon in 1853, since which he has produced ‘Summer Nights’ (1872); ‘Sowing in Autumn’ (1873); ‘The Harlem Sound’ (1885); the two latter being now in the Luxembourg. He was elected to the Institute in 1892. Among his works are ‘Rembrandt’ (1886); ‘Jacob van Ruysdael et les paysagistes de l'école de Haarlem’ (1890); ‘Le maitres du paysage’ (1906); ‘Nouvelles études sur l'histoire de l'art’ (1908); ‘La forêt de Fontainebleu’ (1909).

MICHEL, Louise, French anarchist: b. Vroncourt, Upper Marne, France, 29 May 1830; d. Paris, 9 Jan. 1905. When very young she wrote verses of unusual power and in 1860 opened a school in Paris. In the Franco-German War she tended the sick and wounded and took part in the sorties from Paris; and during the government of the Commune in 1871 she fought at the barricades, was made prisoner, sentenced to deportation for life, and spent some years in New Caledonia, but was pardoned by the amnesty of 1880 and returned to Paris, where she edited ‘La Révolution sociale’ and continued her anarchistic teachings. She was imprisoned in 1883 and in 1886, later made her home in London, where she continued her work and returned to Paris in 1895. Her sobriquet, «The Red Virgin of Montmartre,» was a tribute to the purity of her life. She published ‘Le Coq Rouge’; ‘Les Méprisées’; ‘Ses Mémories’; ‘L'Ere Nouvelle.’ Consult Gerault, E., ‘La bonne Louise’ (1906).

MICHELANGELO, Buonarroti, mī-kĕl-ăn'jĕ-lō or mē-kĕl-än'jā-lō, boo-ō-när-rō'tē, whose name during his lifetime was written as Michelagnolo (or Michelangiolo) di Ludovico di Buonarroti-Simoni; Italian sculptor, painter and architect: b. Caprese, Tuscany, 6 March 1475; d. Rome, 18 Feb. 1564. The family was well established as a family of citizens in Florence; but had been allowed heraldic bearings, a custom not unusual in relation to the controlling families of the Italian cities.

At a very early age Michelangelo became a student of fine art, entering first the workshop of Domenico Bigordi, called Ghirlandajo, and studying also in a primitive kind of art school which had been formed in the palace and gardens of Lorenzo dei Medici. It appears that the extraordinary abilities of the boy were noticed by his patrons and also by the artists of the epoch from the first. Michelangelo thought of himself only as a sculptor, and he put his energies into the study of bas-relief and statuary; studying the remains of Græco-Roman antiquity which were accessible, and producing works of such importance as caused surprise to his contemporaries, although most of these very early works are either lost altogether or are uncertain — pieces which are usually ascribed to this epoch not having certain ascriptions. The earliest very important work which has remained to us is the Pietà, which is now in a chapel of Saint Peter's Church at Rome. The figures are slightly larger than life, the Madonna holding the body of Christ on her lap in a not unusual attitude; a belt passing over the left shoulder of the Virgin is inscribed with the name of Michelangelo the Florentine: which is for years the only case in which Michelangelo signed a piece with his name. The famous group of the Madonna and Child in the Church of Notre Dame at Bruges, in Belgium, is generally accepted as the work of Michelangelo, and if so, was of this early epoch. The reason for its transportation to Bruges is disputed. An entirely authentic piece of the time is a colossal David, which having been for three centuries in the open air at the portal of the Palazzo Vecchio at Florence, is now under shelter in the Accademia in the same city. This extraordinary work is a frank attempt to render the as yet imperfectly developed form of a very young man.

The only portable painting which can with certainty be ascribed to Michelangelo belongs to the closing years of the 15th century, when Michelangelo was approaching the age of 25 years. This is the circular picture, a Madonna with the Child and Saint Joseph, in the Uffizi Gallery. The fact of his producing this and several other small works of painting is not to be counted against his accepted position as a sculptor; for most of the artists of the time practised in the different arts, and it is probable that Michelangelo was at this time much less in the habit of painting than were other sculptors of well-known ability. His own continual occupation upon works of pure form in marble was a sufficient reason for his continued abstention from the sister arts.

With the election of Pope Julius II began the Roman life of Michelangelo, for he was called upon by the new Pope in 1505 to build a great monument which the Pope desired to finish within his own lifetime. This monument was never completed, however, and the controversies and other difficulties which arose continually with regard to it, embittered a large part of the great artist's life and consumed time which could but ill be spared from actual work. The great statue of Moses, which was executed at a somewhat later time (not to be exactly fixed), was the only very important piece of statuary completed for this tomb.

In 1506 Michelangelo returned to Florence, and at that time there was a decided pause in the work upon the tomb, as other thoughts had taken up the mind of the Pope. Indeed, his return to Rome was followed immediately by the commencement of the painting upon the vault of the Sistine Chapel. This work as we have it is much the most important piece of mural painting of the modern world, for it occupies the whole vaulted room, 133 feet long and 45 feet wide, and is one continuous and unbroken composition containing hundreds of figures, life-size, of heroic size, and colossal, and done in pure fresco, except as it has been retouched in places, either by the artist himself or in later times, in what is called dry fresco — that is to say, the colors laid upon the dry plaster. There is this marked characteristic of the painting — that it has no landscape backgrounds except in the small compartments devoted to The Deluge and The Temptation, nor any other accessories as of costume, arms, buildings and the like, but is everywhere a simple architectural composition of painted pedestals and corbels seeming to carry figures which themselves are painted in the most abstract way — studies of the human form simply dressed and having no artistic interest other than that. It has generally been considered that the paintings draw their only importance from the astonishing power of the draughtsmanship and the great composition of abstract lines; but a more careful consideration of what they were before their partial defacement by the smoke of candles and the injuries and repairs which they have received, shows that the work is one of interest as to color composition as well. Michelangelo has never shown himself to be a colorist in the sense in which Correggio and the great Venetians were colorists, but then the medium in which he painted was fresco, that is, painting upon wet plaster, which does not lend itself to elaborate combinations of warm and profuse coloring — its tendency is always toward pale combinations and the expression of delicately modulated form rather than of chromatic splendor. It is not, however, intelligent criticism to say that these paintings are the work of a sculptor taken rudely from the practice of his own art. On the other hand, it is quite unreasonable to say, as some English critics have said, that the turning of Michelangelo to sculpture had been unfortunate, as depriving us of the greatest of Christian religious painters while giving us only a melodramatic sculptor. The truth is that this artist is the most perfect exemplar of that way of treating all fine art, of which form alone (pure and abstract and almost separated from its usual purpose, as that of description and narrative), is the subject studied and gives the effect sought. Everything else — truth of anatomy, expression of face, energy of pose and of apparent movement — is subordinated to the one important thing, the getting of form which would be splendid in the artist's eyes. If, then, we have to regret a frequent excessiveness and extravagance of design, it can only be said that the extraordinary energy and force of the man, driving him on to undertake more than mortal man could achieve even had he been (as Michelangelo was not) left to pursue his own course in peace, resulted as of necessity in frequent exaggeration in the very desire to give vigor and as yet untried combinations of form as shown in the human body posed singly or in elaborate groups.

After 1513, when Julius II died, Michelangelo undertook a façade for the church of Saint Lorenzo in Florence. This front was never finished; but not long after he began the building of a new sacristy for this church, in which square room, very finely adorned with classical architectural forms, are the two remarkable tombs of the princes Lorenzo and Giuliano dei Medici. These monuments have each a seated statue of the prince in question, raised high above the sarcophagus; and on the lid of the sarcophagus two colossal reclining figures, in each case one man and one woman. The sculptures are not all completed. The extraordinary power of their modeling has made these monuments very famous in the modern world.

About 1535 Michelangelo settled finally in Rome, and from that time until his death was very much occupied as an architect in connection with the great church of Saint Peter. The building had been going on for many years, and different architects had successively changed the design, so that Michelangelo took up the work at that point where it became necessary to roof the central mass. This he did by means of the famous cupola which dominates the city of Rome and the country around, although the rounded shell of stone itself was not erected during his lifetime.

As an architect Michelangelo was not, on the whole, beneficial to Italy or to the art of the 16th century, because he had never, as a youth, studied construction or the use of details, and because his almost exclusive devotion to more elaborate and organic forms than those possible to architectural masses, prevented his designing such features as frontons and consols with gravity and simplicity. The architecture inspired by him, and more especially that produced by his immediate successors, ran to extravagance; and the worst period of Italian decorative art was to follow upon his own epoch of work. The sculpture of his later years is much less important and much less in quantity than might have been expected; but the work upon the church occupied his energies, and in 1535 he was appointed by Pope Paul III, architect, sculptor and painter to the papal palace, and he began work immediately upon the east wall of the Sistine Chapel. Here he painted that prodigious 'Last Judgment' filling all the wall above the altar, including the lunette, and up to the nearly semi-circular vault. The picture is, like the ceiling paintings, entirely a study of the human body in vigorous action, and in highly studied pose. As a work of color, or even of light and shade, it is almost unrecognizable for what it was, as the smoke of the candles on the altar has caused very great changes in color, and has led to repainting, and because of certain painted additions made in the next century in order to disguise the complete nudity of the figures.

Throughout his life Michelangelo had been a writer of verse, and it is known that important sonnets of his were left by him. These, however, were edited in a destructive manner by his nephew, so much so that we have at the present day no certain knowledge, even, of what the poems were as they left Michelangelo's hand. This part of his intellectual life has been

MICHELANGELO IN HIS STUDY

Painting by Alexander Cabanel

STATUE OF MOSES, BY MICHELANGELO

treated with great thoroughness by John Addington Symonds in his life of the artist (1892); and on which Walter Pater writes fascinatingly in 'The Renaissance: Studies in Art and Poetry' (1912). The frescoes of the Sistine Chapel have been peculiarly the study of Heath Wilson who, about the middle of the 19th century, had a scaffolding erected in the chapel and studied the paintings inch by inch, and who recorded his observations in a valuable book (1876). Apart from these two books and the life by Harford (1857), the best book on Michelangelo is the volume of the 'Gazette de Beaux-Arts,' published in 1876. This volume contains papers by the sculptor, Eugène Guillaume, the architect, Charles Garnier, and the competent writers, Charles Blanc, Paul Mantz, A. Mézières and Anatole de Montaiglon. Karl Frey's 'Michaelagniolo Buonarrotti' publication of which began in 1907, and Thode's 'Michelangelo und das Ende der Renaissance' (1902–12), are among recent authoritative studies.

Russell Sturgis.

MICHELANGELO, Life of. Herman Grimm's Life of Michelangelo, apart from its value as the record of a notable life, is one of the masterpieces of German prose. Written at a time when photographic illustrations were unknown (it was published in 1860) and when the expense of travel barred Italy to most young artists, its purpose was to give them a vivid and realizable word-picture of the sculptures, paintings and architectural creations of the most universal of all artists, and at the same time to show how constructive a part art can play in the spiritual life of a nation when artists are large enough for leadership.

It is not only a biography; it is a history of the Italian Renaissance with Michelangelo as the central figure. During the 80 years ot his life Italian art knew Donatello, Ghirlandajo, Leonardo da Vinci, Titian and Raphael; Savanarola lived and died praying for the soul of Florence; the Popes — Borgias, Farneses, Medicis — exerted their power for good and ill in the world of the sword as well as the world of the spirit; the Medicis fought for the temporal mastery of Florence and conquered, fought and lost again. In every part of this seething political, religious and artistic life Michelangelo had his share. His life and that of Florence ran parallel lines. The star of Florence had barely risen when Michelangelo sculptured his first marbles in the garden of the Medicis; it had set, never to rise again, before his body was brought back for burial from the Rome which had been his refuge when Florence deserted her tradition of freedom.

It is the achievement of Herman Grimm — that which places this biography with Boswell's Life of Johnson and the Autobiography of Benvenuto Cellini — that he has known how to make the city and the times live equally with the man whom he portrays, and how to give form and color to the figures of the lesser men and women in his picture. Fine illustrations heighten the value and the interest of new editions, both in the original and in the translation by Miss Bunnett.

MICHELET, Jules, zhül mēsh-lā, French historian: b. Paris, 21 Aug. 1798; d. Hyères, 9 Feb. 1874. His father was an unsuccessful printer, and his boyhood was one of poverty and want. He was educated at the Lycée Charlemagne and in 1821 became a professor at the College Rollin. After the revolution of 1830 he was appointed chief of the historical section in the Archives, and in 1838 professor of history at the Collège de France. He lost his offices by his refusal to take the oath of allegiance to Napoleon III (1851) and thereafter devoted himself to his busy literary labors. His 'Histoire de France' (18 vols. 1833–67; new ed. 19 vols. 1879) is among the monumental productions of historical composition, and definitely established his fame. His 'Histoire de la Révolution' (1847–53; new ed. 1889) is a splendid specimen of eloquent writing, but hardly a great history. In all his historical writing Michelet has been criticized for unduly subordinating historical values to dramatic effect and for permitting his prejudices to destroy his perspective. But his descriptions are remarkably vivid, and his rendering of certain episodes is unsurpassed. Among his further writings are 'Précis de l'histoire moderne' (1827); 'Histoire romaine' (1831); several volumes of impressions of nature — 'L'Oiseau' (1856), 'L'Insecte' (1857), 'Z'Amowe' (1859); 'La Mer' (1861); 'La Montagne' (1868); and several volumes of polemics. Consult 'Lives' or studies by brushes (1898); 'Corréard' (1886); 'Monot' (1905); and 'Jules Simon' (1886).

MICHELET, Karl Ludwig, kärl lood'vĭg mēshĕ-lā, German philosopher: b. Berlin, 4 Dec. 1801; d. 16 Dec. 1893. He was graduated from the University of Berlin in 1824, and in 1829 was appointed to the professorship of philology and philosophy in the French gymnasium, which he held for 25 years. In 1829 he also became professor of philosophy in the University of Berlin. He devoted himself especially to the doctrines of Aristotle and published 'Die Ethik des Aristoteles' (1827), an edition of the Nicomachean ethic with Latin commentary (1829–33), and a memoir entitled 'Examen critique du livre d'Aristotle, intitulé Métaphysique' (1836), which was crowned by the Academy of Moral and Political Sciences. From 1832 to 1842 he was engaged as one of the editors of Hegel's works, in illustration of whose system he wrote 'Geschichte der letzten Systeme der Philosophie in Deutschland von Kant bis Hegel' (1837–39); 'Entwickelungsgeschichte der neuesten Deutschen Philosophie' (1843); and a controversial dissertation, 'Schelling und Hegel' (1839). His own standpoint and tendency are most decisively shown in his 'Vorlesungen über die Persönlichkeit Gottes und die Unsterblichkeit der Seele, oder die ewige Persönlichkeit des Geistes' (1841); and 'Die Epiphanie der ewigen Persönlichkeit des Geistes' (1844–52).

MICHELL, mĭch'ĕl, **John,** English physicist, geologist and astronomer: b. about 1724; d. Thornhill, Yorkshire, 29 April 1793. He was educated at Queen's College, Cambridge, became a Fellow there, and in 1762 was made professor of geology. From 1767 until his death he was rector at Thornhill. His invention of the torsion balance shortly before his death preceded that of Coulomb, and was used by Henry Cavendish in his famous experiment determining the mean density of the earth.

Michell also described a method of making magnets, ‹A Treatise of Artificial Magnets, in which is shown an easy and expeditious method of making them superior to the best natural ones› (1750). He also made valuable contributions to the knowledge of astronomy. Author of ‹Conjectures Concerning the Cause and Observations upon the Phenomena of Earthquakes› (1760); ‹A Recommendation of Hadley's Quadrant for Surveying› (1765); ‹Proposal of a Method for Measuring Degrees of Longitude upon the Parallels of the Equator› (1766); ‹An Inquiry into the Probable Parallax and Magnitude of the Fixed Stars› (1767); ‹On the Twinkling of Fixed Stars› (1767); ‹On the Means of Discovering the Distance, Magnitude, etc., of the Fixed Stars› (1784); etc.

MICHELL, John Henry, Australian mathematician: b. 19th century. He was educated at Trinity College, Cambridge, and later became a Fellow there. He became assistant professor of mathematics at the University of Melbourne and is known for his researches in mathematical physics. He was made a Fellow of the Royal Society in 1902. Author of ‹Theory of Free Stream Lines› (1890); ‹The Highest Waves in Water› (1893); ‹The Wave Resistance of a Ship› (1898); ‹The Stress in the Web of a Plate Girder› (1900); ‹Theory of Uniformly Loaded Beams› (1900); etc.

MICHELOZZO, mē'kē-lŏt'sō, **Michelozzi,** Italian architect and sculptor: b. Florence, 1391 or 1396; d. there, 1472. He studied sculpture under Donatello and architecture under Brunelleschi, and was a protégé of Cosimo dei Medici. He worked in silver, bronze and marble as a sculptor and attained a high reputation for his work; but his fame rests principally upon his achievements as an architect, his name ranking among the foremost of the famous Florentine architects of the 15th century. He executed the silver statue of Saint John in the Duomo, Florence, and also the bronze statue of that saint in the Bargello, and the terra cotta figure of him in the court of the church of the Annunziata, Florence. Much of his work as a sculptor was done with Donatello and it is difficult to establish its identity. He designed the library of San Giorgio Maggiore at Venice, as well as other buildings there, during the period when he shared the exile of his patron, Cosimo dei Medici. He designed the Riccardi Palace in Florence for the Medici, and his skill as an engineer was attested by his repairing and partially rebuilding the Palazzo Vecchio, which was falling to ruin. He also undertook the repairs and remodeling of the monastery of San Marco at Florence when it was given to the Dominicans of Fiesole by the Medici. He designed the Medici summer villa at Careggi, the pilgrim's guest-house, Jerusalem, the Medici palace at Fiesole and many other buildings. His style effected a combination of early Italian Gothic and the classical type with marvelous simplicity and lightness, withal stateliness of line. Consult Müntz, E., ‹Histoire de l'Art pendant in Renaissance, Italie› (1889); Wolf, F., ‹Michelozzo di Bartolommeo› (1900).

MICHELS, Robert, German sociologist: b. Cologne, 9 Jan. 1876. He studied at the universities of Paris, Munich, Leipzig and Halle, and in 1905 became docent at the University of Brussels. In 1907 he was appointed teacher of economics at the University of Turin, later becoming professor of that subject. He accepted the chair of economics and statistics at Bazel in 1913. He has specialized in Italian sociological problems and history and has written extensively, his work appearing in Hungarian, Dutch, German, French and Italian. Author of ‹Brautstandsmoral› (1903); ‹Borghesia e proletariato nel movimento Socialisto italiano› (1907); ‹Zur soziologie des Parteiwesens› (1910); ‹Probleme der Sozial-philosophie› (1914), etc.

MICHELSON, Albert Abraham, American physicist: b. Strelno, Posen, Germany, 19 Dec. 1852. He came to the United States when a boy; was graduated at the United States Naval Academy in 1873; took graduate courses in physics in Berlin and Heidelberg and in Paris; and resigned from the navy in 1883 to become professor of physics at the Case School of Applied Science, Cleveland, Ohio. From 1889 to 1892 he was professor of physics at Clark University, and since 1892 has been head of the department of physics in the University of Chicago. He was president of the American Physical Society in 1901, and of the American Association for the Advancement of Science in 1910. His experiments at the Naval Academy in 1879 and at Cleveland in 1882 gave new figures for the velocity of light *in vacuo.* He made careful studies of the relative motion of ether and matter, and apparently proved that, though in general ether may have relative motion, within building walls, etc., it partakes of the motion of materials. About the same date (1886–87) his inferential refractometer made it possible to use wave-lengths of light as a measuring unit; this discovery was put to concrete use by his measuring a metre in terms of cadmium light wave-length; this was done for the Paris International Bureau of Weights and Measures, with the result that the metre is no longer an arbitrary unit, since the original metrelong bar so carefully preserved in Paris could easily be replaced at any time now that its length is known in terms of other units. This interferometer not only determines wave-lengths of red, green and blue cadmium light, but separates lines less than one thousandth metre apart, and hence is a very delicate dividing machine. The echelon spectroscope, an arrangement of glass plates of equal thickness, but of surface area varying in arithmetical progression, was invented by Michelson in 1898; it is valuable for the study of the Zeeman effect. In 1907 he was awarded the Nobel prize in physics. He is the author of ‹Light Waves and their Uses› (1903).

MICHIE, mĭk'ĭ, **Peter Smith,** American military engineer and author: b. Brechin, Scotland, 24 March 1839; d. West Point, N. Y., 16 Feb. 1901. He came to the United States when a child and lived in Cincinnati. He was graduated at West Point in 1863 and was assigned to the engineering corps with rank of first lieutenant. He served as assistant engineer in the operations around Charleston in 1863–64 and as chief engineer of the districts in the Department of the South. In 1864 he was transferred to the Army of the James, served in the operations against Richmond and was present at Appomattox in 1865. He was promoted brevet brigadier-general and later brevet lieutenant-colonel of volunteers in 1865, and was promoted captain in the regular army. He was appointed first assistant in the department of engineering and chemistry at West Point in 1867, and from 1871 until his death he was professor of natural and experimental philosophy there. He served on the board of overseers of the Thayer School of Civil Engineering at Dartmouth from 1871. He was a member of a government commission to Europe in June–November 1870 studying fortifications. Author of 'Wave Motion, relating to Sound and Light' (1882); 'Life and Letters of Emery Upton' (1885); 'Analytical Mechanics' (1886); 'Hydromechanics' (1887).

MICHIGAN, a State in the United States, lies in the region of the Great Lakes between lat. 41° 44′ and 47° 30′ N. and long. 82° 25′ and 90° 31′ W. It is composed of two peninsulas, a northern and a southern, between which pass the Straits of Mackinac, connecting Lakes Huron and Michigan. The State has an area of 57,480 square miles, ranking 22d in the Union. It is the largest except Georgia, east of the Mississippi. Of this area, 40,789 square miles are in the lower peninsula, and 16,691 in the upper; the upper peninsula being less than one-third the area of the State, is thus larger than any New England State, except Maine. The State's peninsular character is reflected in the legend on its seal: *Si Quæris Peninsulam Amœnam, Circumspice* (If you seek a beautiful peninsula, look about you).

Michigan's position has closely associated its development with Ohio, Indiana and Illinois, on the south; with Wisconsin, on the west; and with Canada, on the north and east. It determined that its population should come largely from New York, New England and Canada, and from Europe. Practically surrounded by lakes and rivers, it was naturally equipped to engage extensively in lake commerce and shipbuilding. It has water communication with seven other States and with the province of Ontario in Canada, embracing together a population of about 30,000,000 people. Its chief port is Detroit, whose position, in line with natural transportation facilities to the Atlantic seaboard through the Saint Lawrence Basin and the Mohawk Valley of New York, gives it rank, in relation to immigration and commerce, with Pittsburgh and Saint Louis.

Climate.— The position of the State in the midst of the Great Lakes gives it a climate sufficiently unique to invite comparisons. The mean annual temperature has a range of about 10° — from 39° in the north to 49° in the south; July temperature, from 65° to 72°; that of January, from 19° to 25°; extreme of lowest temperatures in different parts of the State, from 49° to 15° below zero; extreme of highest temperatures, from 96° to 108°. For the year, in the State as a whole, the mean range of temperature is 50° and the extreme range 120°. The longest growing season, 170 days, is in the vicinity of Lake Erie; while the shortest growing season, 100 days, is in the west end of the upper peninsula.

The amount of rainfall varies from 29 inches in the northwest to 40 inches in the southeast; about 60 per cent of the annual rainfall is received in the crop season. The heaviest snowfall is in the region of Traverse City and in the «Copper Country» on Lake Superior. In relative humidity, Michigan is similar to the Atlantic seaboard States, but has a larger number of sunny days in summer. The annual humidity is about 75 per cent. In general, Michigan weather is extremely variable, being in the track of the largest number of low pressure areas, but the constant westerly winds and the Great Lakes tend to modify extremes.

Geology and Physiography.— The oldest part of Michigan is the western half of the upper peninsula, where are found outcrops of Archean rocks — granites, gneisses and schists — as old as any on the continent of North America and similar in age to the highlands of Scotland and Norway. The highest point in the State, in the Porcupine Mountains near Lake Superior, is an outcrop of these rocks, about 1,400 feet above the level of the lake. The whole of this part of the peninsula is broken and rocky, though the drift in the valleys affords a good soil for agriculture. The region is noted chiefly for its minerals. From Keweenaw Point southwestward, across the peninsula, lie copper deposits of exceeding richness, second to none in the world. To the south and east of the copper deposits lie four rich belts of iron ore. Other economic minerals are slate, building stone, graphite, mineral paints, mica, asbestos, oil stone, gypsum, lead and manganese. East of the longitude of Marquette, the peninsula is markedly different, being a rolling, drift-covered hill country, rising scarcely 400 feet above lake level and forming the agricultural section. Along the northern shore of this portion of the peninsula, the Cambrian sandstone, formed in the ancient seas that covered the Michigan basin, has been cut by wave action into fantastic shapes, known as the «Pictured Rocks» of Lake Superior.

In the lower peninsula the arrangement of the bed rocks is simple, being like a nest of basins, one within the other. At the centre the coal basin covers about one-fifth of the area. The minerals of the other basins are various and widely distributed, among which are salt, clay, sand and gravels, limestone and gypsum. At several points are found mineral springs, where popular resorts have grown up to profit by the medicinal value of the waters; chief among these is Mount Clemens, near Detroit. The waters of four mineral springs are marketed. The surface of the lower peninsula lends itself easily to agriculture, grazing, lumbering and manufacture. In general, it is slightly undulating and but little raised above lake level. The peninsula is divided into two portions, which have a few topographical differences; the dividing line is the Grand-Maple-Saginaw Valley, which, extending across it diagonally from the head of Saginaw Bay to Lake Michigan, is nowhere above 100 feet high. North of this central plain rises a plateau, between 700 and 800 feet above the lakes, forming the watershed between Lakes Michigan and Huron. At a point near Otsego Lake, this plateau reaches a height of 1,100 feet. On the north and northeast, outcrops of bed rock give the coast an abrupt and somewhat forbidding appearance. The portion of the peninsula south of the central plain rises rarely above 200 feet, broken by low conical hills, whose fertile intervening dales form the courses of small streams. At the east, a morainal elevation, forming two watersheds, rises in Hillsdale County, 600 feet above the lakes, the highest point in this part of the State. The southeastern shore is low and comparatively level. Along a large part of the entire western shore of the peninsula, wind-blown sand dunes reach, in places, a height of 200 and 300 feet.

Off the shores of the two peninsulas lie some 200 islands within the State boundaries, the largest of which is Isle Royale, in Lake Superior. Others of the largest islands are: In Lake Superior — Grand Isle; in Lake Michigan — Beaver, Fox and Manitou; and in Lake Huron — Sugar Island, Encampment Island, Drummond Island, Bois Blanc and Mackinac. The coolness of the summer climate of the upper Great Lakes has made of that region a delightful watering place, particularly in the vicinity of the Straits of Mackinac. Of the island resorts the most widely known is the picturesque Mackinac Island.

Soil.— The three principal soil types of the two peninsulas are determined by the relative amount of sand, clay and lime. In the southern peninsula, the soils vary from the light sandy loam of the north central plateau to heavy blue clay, on the Huron shore, and to the dark clay loam of southern Michigan. The wide distribution of sand gives warmth to the soil, and its porosity prevents the drowning of crops; while the generous depth of the soil keeps it from drying out. There is little irreclaimable marshland. In general, the soil is easy to work, presenting but little stony land like New England and very few barrens due to outcrops. The mixture of clay and sand makes a soil not too adhesive for the plow and one not easily washed full of gullies. The limestone areas are specially fortified against deterioration through wasteful farming, and in many places there is an abundance of natural fertilizers. In the upper peninsula, in the west, the rocks are either barren or thinly covered, with an occasional fertile valley; in the east, the soil is of good depth and generally rich in a variety of mineral elements.

Drainage and Water Power.— Michigan has more than 5,000 interior lakes, mainly of glacial origin. Many of those near the shores, especially of Lake Michigan, were once a part of the Great Lakes. They vary in size from an acre to a thousand acres, covering in the aggregate an area of 712,864 acres. Generally they have a border of woodland and sandy or muddy margins, with more or less vegetable and animal life. Many of these lakes are beautiful pleasure resorts. Streams are fed by these lakes, which together with them form an equable system of drainage. The rivers, though numerous, are relatively short and shallow, owing to the peninsular character of the State. Some have cut deep enough to form rapids, especially in the north, furnishing water power. Of the large power they could develop, 250,000 horse power is now furnished, mainly by the Saint Mary's, the Au Sable, the Menominee, the Saint Joseph, the Muskegon, the Grand, the Kalamazoo, the Huron and the Thunder Bay. In lumbering days, the Saginaw, the Muskegon and the Menominee were chief among the many rivers for transportation of logs to mill. Aside from the strait-like Saint Mary's, Saint Clair and Detroit rivers, Michigan streams are not navigable, except for the smallest of river craft. Worthy of mention, besides the rivers named, are, in the lower peninsula, the Clinton, the Raisin, the Rouge, the Black and the Manistee; in the upper peninsula, the Taquamenon, the Carp, the Sturgeon, the Manistique, the Rapid, the Whitefish, Falls River and Dead River. The waters of these rivers are received by numerous bays and inlets which indent the shores; of these, the largest along the upper peninsula are Keweenaw, White Fish and the Big and Little Noquette bays; along the lower peninsula, the Grand and Little Traverse, the Thunder and Saginaw bays.

Agriculture.— The chief industry of the State is farming, which engages about a third of the population. The value of farm property is double the capital in manufacturing and about one-half of the total assessed valuation of all property in the State. About one-half of the lands are in farms, of which about two-thirds are improved. Of the half not in farms, about one-half would make good farm land. Less than one-fifth of the upper peninsula is in farms, with about 12 per cent of the total farming population of the State In the lower peninsula, nine-tenths of the farms and 70 per cent of the farm population is south of the latitude of the northern boundary of Midland County. In general, Michigan lands produce many kinds of crops on each farm, contributing about half of the total value. Corn is the leading crop, raised mainly in the southern part of the lower peninsula; only a few hundred acres are raised in the upper peninsula and in the northern third of the lower peninsula only about as much as in any one of the better southern counties. The wheat crop is second and has been decreasing since 1900, the yield is only about one-fifth that of Minnesota. Wheat raising tends to concentrate in the central part of the lower peninsula. Oats rank third in the State. The hay crop, chiefly clover and timothy, is widely distributed and yields about one-fourth of the total value of farm crops. A great variety of vegetables are raised, in large quantities. Michigan leads in beans and peas. The estimated output of beans in 1922 was 4,809,000 bushels, valued at $17,553,000. Owosso is the centre of the bean area. The pea belt includes the northeast and east central parts of the lower peninsula. The west central part of

CEREAL CROP STATISTICS, 1922

CROP	Acres	Yield, bushels	Value
Corn	1,720,000	60,716,000	$40,680,000
Wheat	1,023,000	14,326,000	16,475,000
Oats	1,498,000	49,434,000	20,268,000
Rye	648,000	8,294,000	6,303,000
Barley	140,000	3,500,000	2,275,000
Buckwheat	62,000	868,000	694,000
Total cereals	5,091,000	137,138,000	$86,695,000

the peninsula has the largest crops of potatoes, in which Michigan ranks third.

CROP	Acres	Yield	Value
Hay (tame)....	3,074,000	2,873,000 tons	$45,016,000
Potatoes.......	357,000	37,842,000 bu.	12,866,000
Beans.........	458,000	4,809,000 bu.	17,553,000
Clover seed....	150,000	240,000 bu.	2,520,000
Sugar beets....	83,000	690,000 tons	3,898,000
Total.....	4,122,000	....	$81,853,000

The following table shows the acreage, yield and yield per acre of corn, potatoes, sugar beets and hay and forage for the year 1922:

CROP	Acres	Yield	Yield per acre
Corn........	1,720,000	60,716,000 bu.	35.3 bu.
Potatoes.....	357,000	37,842,000 bu.	106.0 bu.
Sugar beets...	83,000	690,000 tons	8.33 short tons
Hay and forage........	3,074,000	2,873,000 tons	.93 tons

In 1920, the year of the last census, there were in the State 196,447 farms comprising 19,032,961 acres, of which 12,925,521 acres were improved land. The value of all farm property the same year was $1,763,334,778, of which $1,436,686,210 represented the value of land and buildings, $122,389,936 the value of implements and machinery, and $204,258,632 the value of live stock. The average acreage per farm in 1920 was 96.9, the improved land acreage per farm 65.8, while the average value per farm of all farm property was $8,976, of which $7,313 represented the average per farm of land and buildings, $623 the average per farm of implements and machinery, and $1,040 the average farm value of live stock. The average value per acre of all farm property was $92.65, of which $50.40 was represented by land, $25.09 by buildings, $6.43 by implements and machinery and $10.73 by live stock.

On the muck lands are raised large quantities of celery, chicory and peppermint, in the production of which Michigan is the leading State. In the vicinity of Kalamazoo are the most famous celery beds in the Union. Southwestern Michigan is the chief source of peppermint for the world. Of Michigan farms, more than four-fifths are cultivated by the owners. Less than 5 per cent are operated by cash tenants and 11.9 per cent by share tenants. The following table shows the general development of Michigan farming by decades since 1860:

YEAR	Number of farms	Acres in farms	Value of farm property	Value of farm products
1860	62,422	7,030,834	$190,371,098	....
1870	98,786	10,019,142	369,409,941	....
1880	154,008	13,807,240	574,242,654	$91,159,858
1890	172,344	14,785,636	647,938,255	83,651,390
1900	203,261	17,561,698	690,355,734	146,547,681
1910	206,960	18,940,614	1,088,858,379	....
1920	196,447	19,032,961	1,763,334,778	498,152,004

Fruit-growing.— The principal orchard products are peaches and apples, but large quantities are raised of pears, plums, cherries and grapes. They are quite uniformly distributed over the southern half of the State. Of peaches and grapes, more delicate varieties are raised, in larger quantities, in the «fruit belt,» extending along the Lake Michigan shore, north as far as the Grand Traverse region. There, more attention can be given, where the lighter soil makes the raising of more reliable crops less profitable; a strong demand is present in the markets of Chicago and Milwaukee, easily and quickly reached by lake steamers; the concentration of the industry favors better organization as to methods of culture and marketing; the presence of Lake Michigan, tempers «cold waves,» diminishing danger from killing frosts, lengthens the growing season and increases the humidity. In this belt are raised large crops of strawberries, blackberries, raspberries and currants, in which Michigan ranks second among the States. In the production of peaches, Michigan ranks with Ohio, Pennsylvania and New York, and is a leading State in the production of cherries.

Stock Farming and Dairying.— Horses, dairy cows, sheep, swine and fowls are the chief domestic animals raised in Michigan. In the production of wool, the State ranks second only to Ohio, east of the Mississippi.

	Estimate on farms 1 Jan. 1919	
Horses and mules...........	670,000	$70,354,000
Milch cows.................	848,000	70,384,000
Other cattle................	729,000	28,358,000
Sheep......................	2,119,000	26,488,000
Swine......................	1,355,000.	31,978,000
All live stock...........	5,721,000	$227,562,000

On 1 Jan. 1923 there were in Michigan 1,171,000 sheep, 594,000 horses, 977,000 milch cows, 611,000 other cattle and 1,135,000 hogs. The dairy interests are rapidly increasing. Of 1,586,042 cattle in 1920, 1,256,141 were dairy cattle. This industry is mainly in southern Michigan, though the upper peninsula is well adapted to the raising of dairy herds. The industry supports 318 creameries, condensaries and cheese factories, located chiefly in rural centres. In butter and cheese making, the Hollanders have made Ottawa the leading county of the State. In general dairy products, Michigan ranks about equal with Wisconsin, Illinois, Indiana and Ohio. Cheese making is falling off in Michigan, with the increase of creameries and condensaries to supply the demand for milk and cream in rapidly-growing cities.

	Number
Milk produced on farms..............	382,822,631 gals.
Butter made on farms................	25,755,423 lbs.
Cheese made on farms................	76,660 lbs.

Lumbering and Forestry.— Of the products of the soil, Michigan's forests have been one of the most important sources of her material wealth. The great variety and abundance of both hard and soft woods has made it a leading State in lumber and in timber products. Roughly, the forests originally presented two strongly marked divisions, separated by the 43d parallel of latitude; the pine and soft woods were north, the hard woods south. South of this latitude, the principal farming area, the vicissitudes of early settlement rapidly and permanently destroyed the forests, excepting woodlots, which now aggregate one or two townships per county. North of this latitude in the lower peninsula, the principal hard woods are above a line from Ludington to Oscoda, and very scattered. The hard wood forests of the upper peninsula are chiefly in the eastern part, on the rolling lands of the glacial moraines. Pine lumbering, which reached its climax in 1890, has cut most of the white pine from the State. The present stage of lumbering is taking the hard woods and the remaining pine, mainly in the upper peninsula. Lumbering has had exceptional advantages in Michigan; the timber was massed in large stands, making large scale operations possible; and it was located mainly on large streams, down which logs could be floated to mill, and the lumber thence to the Great Lakes, by which markets could be easily reached. The first great impulse in Michigan pine lumbering came with the opening of an eastern market, due to the exhaustion of eastern forests and the development of railroads; the growth of Chicago and the settlement of the prairie States furnished a stimulus from the West. In 1890 Michigan produced 4,245,717,000 feet of lumber; since then she has dropped from first place to tenth place. Out of the lumber industry have grown most of the cities of the State above the latitude of the Saginaw Valley, which was the first great centre of pine lumbering; exceptions are Sault Sainte Marie and cities in the mining districts. The cities have now found in manufacturing a basis for permanent growth, principally in the manufacture of timber products. The following table shows the development of lumbering in Michigan since 1860:

YEAR	Establishments	Capital	Average number of wage earners	Wages	Value of products
1860	......	....	....	....	$7,040,190
1870	1,571	$26,990,450	20,058	$6,400,283	31,946,396
1880	1,649	39,260,428	24,235	6,967,905	52,449,928
1890	2,124	129,467,072	54,308	15,548,833	83,121,969
1900	1,705	67,379,698	26,199	11,122,030	54,290,520
1909	1,180	57,290,000	35,627	16,298,000	61,513,560
1919	633	73,929,380	21,979	22,021,000	90,607,000

In 1903 the State set aside 34,000 acres of State lands and an annual appropriation of $7,500 for forestry purposes, now increased to $60,000 per annum, making possible extensive forest protection and reforestation. The State now holds 53 forest reserves aggregating about 235,000 acres, which is under the administration of the Public Domain Commission.

Minerals and Mining.— In the upper peninsula, whose copper and iron mines are among the most valuable in the world, the chief competitor of lumbering and agriculture is mining. Native copper was known and mined in the Lake Superior region by a primitive people hundreds of years ago. It is first mentioned in a book by Legardes published in 1836. Its commercial development was begun in 1842, by Boston capital, in Keweenaw County; the beginning of well-organized mining began in 18k6, with the discovery of the Calumet and Hecla conglomerate lode, in Houghton County; that county produces more than four-fifths of Michigan's output to-day, one-half of which is mined near Calumet. This copper averages about 20 pounds per ton of rock. The advantages for mining here are the relative purity of the copper; the concentration of abundant pay-rock in mines fairly dry and needing little timbering; the altitude of the mine mouths, permitting the use of a natural incline to stamp mills at lake level; and an all-water route for shipment to market. The total product from these mines aggregates approximately 5,345,000,000 pounds, which gives Michigan rank in total produce second only to Montana; in annual output the State is surpassed only by Montana and Arizona.

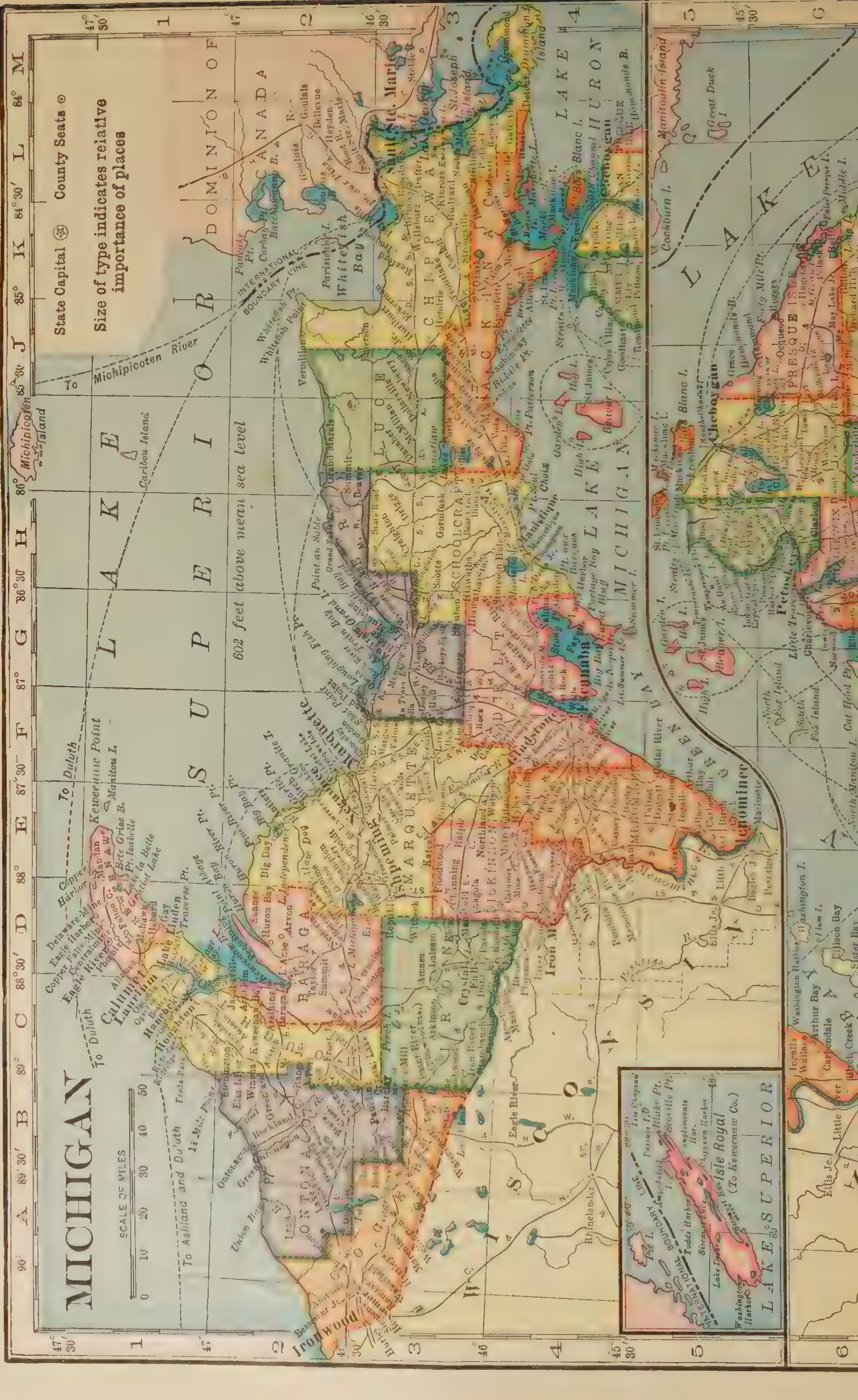
Iron was discovered in 1844, near Ishpeming. The first ore was mined and smelted in 1841, by capital from Jackson, Mich. In the period centring about the Civil War, more than 50 companies were organized, the great demand for war purposes having forced the improvement of the Marquette Railroad and the «Soo» Canal and led to a new period of settlement in the upper peninsula. The chief iron regions are the Marquette Range, the Menominee Range and the Gogebic Range. In all of these there are unusual advantages for mining; high grade ores, concentration in small area, down-grade short hauls from the mines, the proximity of timber and an all-water route to market. Most of the ore is shipped east for smelting; the first shipment, of 70 tons, from the Marquette Range, was smelted at Sharon, Pa. Michigan's share in building national industry has been largely through her iron supply to the markets of the East. The total production has been approximately 450,000,000 long tons. The annual output of these mines is equaled only by that of Minnesota, in the United States; it is twice that of Russia, nearly three times that of Sweden and more than that of either France or Spain.

Other minerals are salt, gypsum, clay, limestone, sandstone, granite, slate, marl, peat, coal and graphite. Michigan leads in salt, which is found chiefly in three belts, one extending from Wyandotte to Harbor Beach, a second in the Saginaw Valley and a third near Manistee and Ludington. The chief gypsum deposits are at Grand Rapids and Alabaster, the quarry at Alabaster being the largest in the world. Most of the limestone is buried too deep under glacial drift to be quarried. The most valuable outcrops of sandstone are on the south shore of Lake Superior. Peat bogs abound in the lower peninsula, but have not been worked, owing to the relative cheapness of other fuel. The coal basin covers about 8,000 square miles in the centre of the lower peninsula, estimated to contain about 80,000,000,000 tons, of which about half is in workable seams. This coal is mainly of a low bituminous variety; of the annual output of 1½ million tons, valued at about $3,330,000, all but about 2 per cent is mined in Bay and Saginaw counties.

Manufacturing.— Michigan has over 8,000 manufacturing industries, employing about 470,000 men and a capital of over $2,300,000,000.

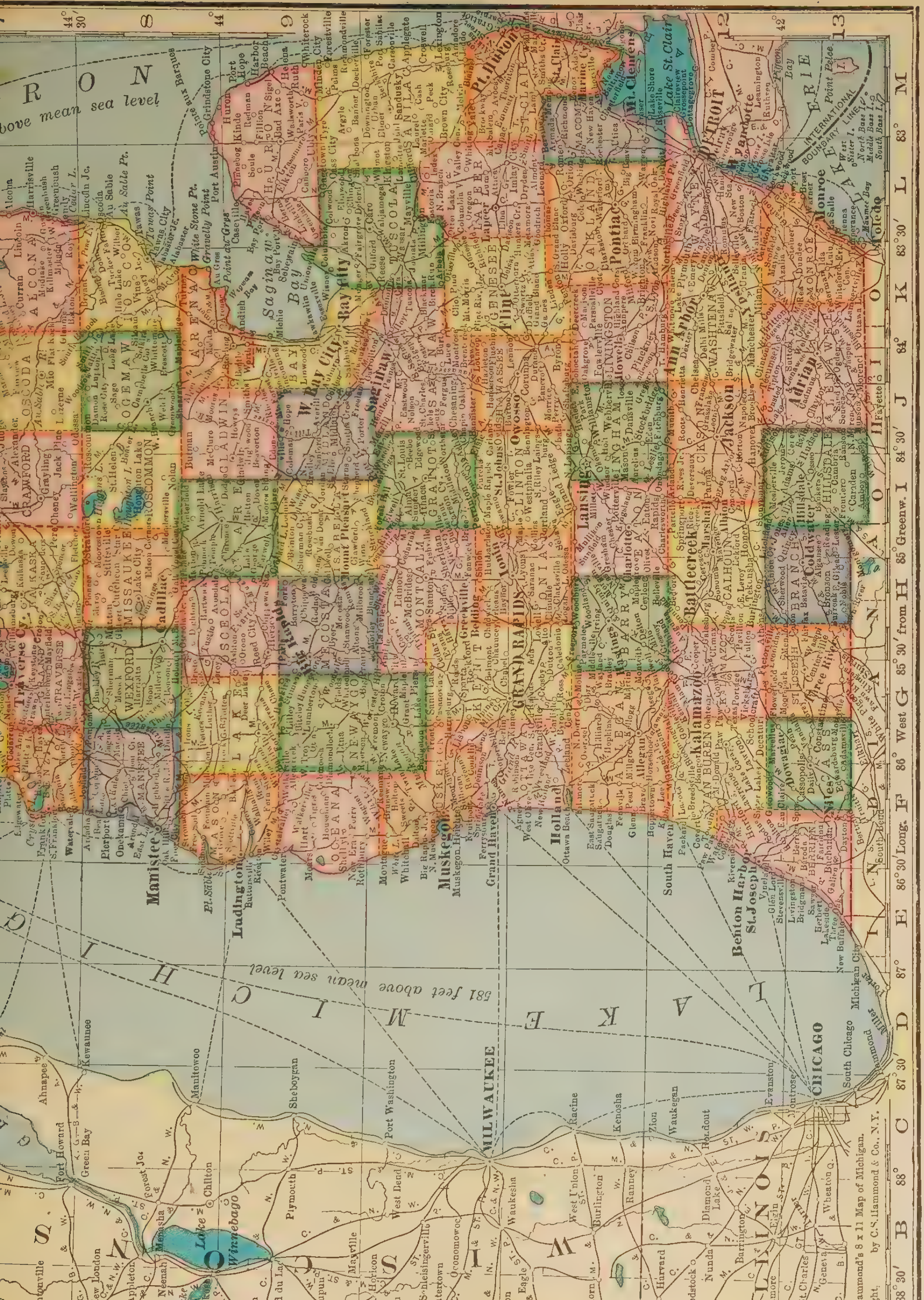
MICHIGAN

Ada, (G11)	450
Adair, (M11)	200
Addison, (J12)	416
Adrian, (J13)	11,878
Ahmeek, (C1)	892
Akron, (L9)	505
Alabaster, (K8)	600
Alanson, (I6)	332
Alba, (H7)	600
Albion, (I12)	8,354
Alden, (H7)	400
Alger, (J8)	225
Algonac, (M11)	1,303
Allegan, (G11)	3,637
Allen, (I13)	550
Allendale, (F11)	200
Allouez, (D1)	1,150
Alma, (I10)	7,542
Almont, (L10)	789
Alpena, (L6)	11,101
Alpha, (C3)	818
Alto, (H11)	350
Amasa, (D3)	800
Anchorville, (M11)	420
Anderson, (J11)	200
Ann Arbor,(K12)	19,516
Applegate, (M10)	177
Arcadia, (F8)	800
Armada, (M11)	711
Ashley, (J10)	596
Ashton, (H9)	200
Athens, (H12)	553
Atlanta, (J7)	250
Atlantic Mine, (C2)	250
Attica, (L10)	400
Auburn, (J9)	300
Augusta, (H12)	651
Avoca, (M11)	400
Axin, (G8)	520
Bad Axe, (M9)	2,140
Bailey, (G10)	350
Baldwin, (G9)	471
Baltic, (D1)	2,480
Banat, (E5)	200
Bancroft, (J11)	529
Bangor, (F12)	1,243
Bannister, (J10)	400
Baraga, (C2)	942
Bark River, (F4)	780
Baroda, (F13)	223
Barryton, (H9)	364
Bath, (J11)	300
Bay City, (K9)	47,554
Bay Port, (L9)	250
Bayshore, (H6)	300
Bay Side, (K9)	320
Beacon, (D3)	1,000
Bear Lake, (F8)	323
Beaverton, (J9)	549
Bedford, (H12)	230
Beech, (L12)	200
Belding, (H10)	3,911
Bellaire, (H7)	624
Belleville, (K12)	626
Bellevue, (H12)	1,035
Bennington, (J10)	270
Bentley, (J9)	250
Benton Harbor, (E12)	12,233
Benzonia, (F7)	543
Bergland, (B2)	620
Berlin, (G10)	340
Berrien Center,(F13)	200
Berrien Springs,(F13)	918
Berville, (M11)	230
Bessemer, (A3)	5,482
Beulah, (F7)	400
Big Bay, (E2)	330
Big Beaver, (L11)	200
Big Rapids, (H9)	4,558
Bingham, (H9)	820
Birch Run,(K10)	250
Birmingham,(L11)	3,694
Blanchard, (H10)	220
Blaney, (H3)	280
Blissfield, (K13)	1,906
Bloomingdale, (G12)	486
Boardman, (H7)	311
Boon, (G8)	300
Borland, (H9)	520
Boyne, (H6)	4,284
Boyne Falls, (H6)	241
Breckenridge, (I10)	698
Bridgeport, (J10)	340
Bridgman, (E13)	250
Brighton, (K11)	800
Brimley, (K3)	406
Britton, (K12)	383
Bronson, (H13)	1,257
Brooklyn, (J13)	611
Brown City, (M10)	828
Buchanan, (F13)	3,187
Buckley, (G8)	352
Burnips, (G11)	200
Burroak, (H13)	589
Burt, (J10)	200
Butternut, (I10)	250
Byron, (J11)	376
Byron Center, (G11)	340
Cadillac, (H8)	9,750
Caledonia, (H11)	432
Calumet, (C1)	30,000
Cambria, (I13)	350
Camden, (I13)	398
Capac, (M10)	791
Carleton, (K12)	498
Carney, (E4)	400
Caro, (L10)	2,704
Carrollton, (J10)	2,200
Carson City, (I10)	973
Carsonville, (M10)	536
Caseville, (L9)	385
Casnovia, (G10)	333
Caspian, (C3)	1.912
Cass City, (I9)	1,228
Cassopolis, (F13)	1,385
Cedar, (G7)	610
Cedarlake, (I10)	676
Cedar River, (F5)	250
Cedar Springs, (H10)	1,020
Cement City, (G11)	500
Centerville, (G13)	701
Central Lake, (H6)	813
Ceresco, (H12)	350
Champion, (E2)	2,200
Channing, (E3)	500
Charlevoix, (H6)	2,218
Charlotte, (I11)	5,126
Chase, (G9)	200
Chassell, (D2)	720
Chatham, (G3)	730
Cheboygan, (J5)	5,642
Chelsea, (I12)	2,079
Chesaning, (J10)	1,387
Chippewa Lake, (H9)	300
Clare, (I9)	1,462
Clarkston, (K11)	419
Clarkville, (H11)	380
Clawson, (L11)	200
Clayton, (J13)	306
Clifford, (L10)	327
Climax, (H12)	395
Clinton, (J12)	961
Clio, (K10)	1,256
Clyde, (K11)	210
Coburntown,(C1)	800
Coldwater, (I13)	6,114
Coleman, (I9)	769
Coloma, (F12)	663
Colon, (H13)	745
Columbiaville, (L10)	656
Commerce, (K11)	250
Comstock, (G12)	200
Comstock Park(G10)	300
Concord, (I12)	535
Conklin, (G10)	450
Constantine, (G13)	1,277
Cooks, (H4)	800
Cooper, (G12)	250
Coopersville, (G10)	914
Copemish, (F8)	284
Coral, (H10)	390
Corunna, (J11)	1,571
Covert, (F12)	360
Cross Village,(H5)	300
Croswell, (M10)	1,678
Crump, (J9)	350
Crystal, (I10)	300
Crystal Falls, (C3)	3,394
Custer, (F8)	269
Dagget, (E5)	321
Dansville, (J11)	299
Davis, (M11)	200
Davisburg, (L11)	300
Davison, (L11)	811
Dearborn, (L12)	2,470
Decatur, (G12)	1,270
Deckerville, (M9)	782
Deerfield, (K13)	442
Defiance, (F3)	200
Deford, (L9)	200
Delhi Mills, (K12)	200
Delta, (I10)	280
Delton, (H11)	300
Demmon, (C1)	200
Detour, (M4)	612
Detroit, (M12)	993,678
Deward, (I7)	300
De Witt, (J10)	450
Dexter, (K12)	587
Dice, (J10)	300
Dick, (K3)	300
Dighton, (H8)	560
Dimondale, (H11)	360
Diorite, (E2)	400
Dodgeville, (C1)	300
Dollar Bay, (C1)	1,820
Dollarville, (I3)	440
Dorr, (G11)	350
Douglas, (F11)	305
Dowagiac, (F12)	5,440
Drenthe, (F11)	210
Drummond, (M3)	300
Dryden, (L11)	359
Dundee, (K13)	1,108
Durand, (J11)	2,672
East Grand Rapids, (G11)	1,310
E. Jordan, (H6)	2,428
E. Lake, (F7)	675
E. Lansing, (I11)	1,889
Eastport, (H6)	200
E. Saugatuck, (F11)	300
E. Tawas, (L8)	1,398
Eaton Rapids,(I12)	2,379
Eau Claire, (F12)	293
Ecorse, (L12)	4,394
Edmore, (H10)	772
Edwardsburg, (F13)	392
Elberta, (F7)	588
Elk Rapids, (G7)	684
Elkton, (L9)	500
Ellsworth, (G6)	380
Elm Hall, (I10)	370
Elmira, (H6)	500
Eloise, (J10)	720
Elsie, (F7)	680
Empire, (F7)	298
Engadine, (I4)	200
Erie, (K13)	350
Escanaba, (G4)	13,103
Essexville, (K9)	1,538
Eureka, (I10)	210
Evans, (H10)	280
Evart, (H9)	1,326
Ewen, (B2)	480
Fairfax, (H13)	200
Fairfield, (J13)	350
Fairgrove, (K9)	452
Fair Haven, (M11)	300
Fargo, (M10)	300
Farmington, (L12)	853
Farwell, (J9)	449
Fennville, (F11)	547
Fenton, (K11)	2,507
Fenwick, (H10)	360
Ferndale, (L11)	2,640
Ferrysburg, (F10)	360
Fife Lake, (H7)	215
Filer City, (F8)	500
Fillmore Center, (F11)	200
Flatrock, (L12)	650
Flint, (K10)	91,599
Flushing, (J10)	1,169
Ford, (L12)	4,294
Ford River, (F4)	720
Foster City, (E4)	300
Fostoria, (L10)	400
Fountain, (F8)	222
Fowler, (I11)	472
Fowlerville, (J11)	1,057
Frankenmuth, (K10)	733
Frankfort, (F7)	1,244
Fraser, (M11)	247
Frederic, (I7)	400
Freeland, (J9)	450
Freeport, (H11)	398
Free Soil, (F8)	210
Fremont, (G10)	2,180
Frontier, (I13)	230
Fruitport, (F10)	321
Fulton, (H12)	350
Gaastra, (C3)	911
Gagetown, (L9)	440
Gaines, (K11)	260
Galesburg, (H12)	692
Galien, (E13)	460
Garden, (H4)	395
Garnet, (J3)	240
Gaylord, (I6)	1,701
Germfask, (H3)	740
Gert, (K13)	200
Girard, (H12)	250
Gladstone, (F4)	4,953
Gladwin, (I9)	1,225
Gobleville, (G12)	491
Goetzville, (L3)	340
Goodrich, (L11)	300
Gowen, (H10)	325
Graafschap, (F11)	200
Grand Blanc, (K11)	300
Grand Haven, (F10)	7,205
Grand Junction, (F12)	200
Grand Ledge, (I11)	3,043
Grand Marais, (I3)	520
Grand Rapids, (G11)	137,634
Grandville, (G11)	799
Grant, (G10)	473
Grasslake, (J12)	744
Grawn, (G7)	250
Grayling, (I7)	2,450
Greenfield, (L12)	200
Greenland, (B2)	1,560
Greenville, (H10)	4,304
Gregory, (J11)	250
Grind Stone City, (M6)	500
Grosse Ile, (L12)	800
Grosse Pointe, (M12)	2,084
Grosse Pointe Farms, (M12)	1,649
Grosse Pointe Park, (M12)	1,355
Grosse Pointe Shores, (M12)	519
Gwinn, (F3)	2,620
Hadley, (L11)	330
Halfway, (M12)	720
Hamburg, (K12)	250
Hamilton, (F11)	475
Hamtramck, (L12)	48,615
Hancock, (C1)	7,527
Hanover, (J12)	350
Harbor Beach, (M9)	1,927
Harbor Springs, (H6)	1,600
Harriette, (G8)	226
Harrison, (I8)	399
Harrisville, (L7)	460
Hart, (F9)	1,590
Hartford, (F12)	1,361
Hartland, (K11)	220
Harvard, (H10)	240
Haslett, (J11)	200
Hastings, (H11)	5,132
Hemlock, (J10)	280
Hendricks Quarry, (J3)	200
Henrietta, (J12)	200
Herman, (D2)	300
Hermansville, (E4)	1,200
Hersey, (H9)	284
Hesperia, (F9)	439
Hessel, (L4)	200
Highland, (K11)	350
Highland Park, (K11)	46,499
Hillman, (K6)	400
Hillsdale, (I13)	5,476
Hilltop, (E12)	225
Holland, (F11)	12,183
Holly, (K11)	1,888
Holt, (J11)	350
Holton, (F10)	300
Homer, (I12)	1,076
Honor, (F7)	239
Hopkins, (G11)	560
Horton, (J12)	380
Houghton, (C1)	4.466
Howard City, (H10)	913
Howell, (J11)	2,951
Hubbard Lake, (K7)	200
Hubbardston, (H10)	368
Hubbell, (D1)	1,004
Hudson, (J13)	2,464
Hudsonville, (F11)	300
Humboldt, (E2)	270
Ida, (K13)	280
Imlay City, (L11)	1,211
Indian River, (I6)	350
Ingalls, (E5)	530
Inkster, (L12)	240
Interlochen, (G7)	300
Ionia, (H10)	6,935
Iron Mountain, (D4)	8,251
Iron River, (C3)	4,295
Ironwood, (A3)	15,739
Isabella, (G4)	200
Ishpeming, (E3)	10,500
Ithaca, (I10)	1,929
Iva, (J10)	150
Jackson, (J12)	48,374
Jacobsville, (C2)	820
Jamestown, (G11)	300
Jasper, (J13)	300
Jennings, (H8)	980
Johannesburg, (I6)	700
Johns Woods, (M4)	200
Jones, (G13)	200
Jonesville, (I12)	1,274
Kalamazoo, (G12)	48,487
Kalkaska, (H7)	866
Kawkawlin, (K9)	250
Kearsarge, (D1)	820
Kendall, (G12)	200
Kent City, (G10)	428
Kenton, (C3)	425



MICHIGAN

State Capital ⊛
County Seats ⊙
Size of type indicates relative importance of places
SCALE OF MILES
0 10 20 30 40 50
602 feet above mean sea level
LAKE SUPERIOR
DOMINION OF CANADA
INTERNATIONAL BOUNDARY LINE
LAKE MICHIGAN
LAKE HURON
GREEN BAY
WISCONSIN
Isle Royal (To Keweenaw Co.)
Michipicoten Island
Caribou Island
Keweenaw Point
Whitefish Bay
Marquette
Ishpeming
Escanaba
Menominee
Gladstone
Sault Ste. Marie
Calumet
Laurium
Houghton
Hancock
Ironwood
Iron Mt.
Cheboygan
Petoskey
St. Ignace
Mackinac I.
Manistique
Munising
Negaunee
Bessemer
Crystal Falls
Iron River
Newberry
Rhinelander
GOGEBIC
ONTONAGON
HOUGHTON
KEWEENAW
BARAGA
MARQUETTE
IRON
DICKINSON
MENOMINEE
DELTA
ALGER
SCHOOLCRAFT
LUCE
CHIPPEWA
MACKINAC
CHEBOYGAN
PRESQUE ISLE
EMMET
CHARLEVOIX
A B C D E F G H J K L M
1 2 3 4 5 6
90° 89°30′ 89° 88°30′ 88° 87°30′ 87° 86°30′ 86° 85°30′ 85° 84°30′ 84°
47°30′ 47° 46°30′ 46° 45°30′



Hammond's 8 x 11 Map of Michigan,
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MICHIGAN - Cont'd.

Kinde, (M9)	420
Kinderhook, (H13)	200
Kingsley, (G7)	350
Kingston, (L10)	321
Kipling, (F4)	420
Laingsburg, (J11)	693
Lake, (G10)	200
Lake City, (H8)	582
Lake Linden, (D1)	2,182
Lake Odessa, (H11)	1,246
Lakeside, (E13)	200
Lakeview, (H10)	886
Lamb, (M11)	200
Lamont, (G10)	200
L'Anse, (D2)	1,013
LANSING, (I11)	57,327
Lapeer, (L10)	4,723
Laurium, (C1)	6,696
Lawrence, (F12)	664
Lawton, (G12)	1,073
Legrand, (I6)	250
Leland, (G6)	340
Lenox, (M11)	350
Leonard, (L11)	264
Leonidas, (H12)	300
Leroy, (G8)	642
Leslie, (I12)	1,089
Levering, (K4)	350
Lewiston, (J7)	550
Lexington, (M10)	378
Liberty, (K10)	200
Linden, (K11)	579
Linwood, (J9)	200
Litchfield, (I12)	716
Long Rapids, (K6)	200
Loomis, (I9)	300
Loretto, (E4)	720
Lowell, (H11)	1,730
Ludington, (E9)	8,810
Lum, (L10)	250
Luther, (G8)	396
Lyons, (H11)	574
McBain, (H8)	547
McBrides, (H10)	220
McMillan, (I3)	200
Mackinac Island, (I5)	493
Mackinaw, (I5)	679
Macomb, (M11)	200
Macon, (K12)	240
Mancelona, (H7)	1,214
Manchester, (J12)	1,024
Manistee, (F8)	9,694
Manistique, (H4)	6,380
Manton, (H3)	793
Maple City, (G7)	200
Maple Rapids, (I10)	466
Marcellus, (G12)	966
Marenisco, (A3)	480
Marine City, (M11)	3,731
Marion, (H8)	708
Marlette, (L10)	969
Marquette, (F2)	12.718
Marshall, (I12)	4,270
Martin, (G11)	450
Marysville, (M11)	941
Mason, (I11)	1,879
Mass, (B2)	1,000
Matherton, (I10)	200
Mattawan, (G12)	300
Maybee, (K12)	290
Mayville, (L10)	652
Mears, (E9)	250
Mecosta, (H9)	297
Memphis, (M11)	452
Mendon, (H12)	625
Menominee, (F6)	8,907
Merrill, (J10)	636
Mesick, (G8)	318
Metamora, (L11))	271
Metropolitan, (E4)	520
Michigamme, (D2)	970
Middleton, (I10)	450
Middleville, (H11)	833
Midland, (J9)	5,483
Milan, (K12)	1,557
Milford, (K11)	1,088
Millbrook, (H9)	400
Millersburg, (J6)	243
Millet, (I11)	200
Millington, (L10)	689
Minden City, (M9)	283
Mineral Hills, (C3)	384
Mio, (J7)	200
Mohawk, (D1)	1,000
Monroe, (L13)	11,573
Montague, (F10)	845
Montgomery, (I13)	354
Montrose, (K10)	522
Morenci, (J13)	1,697
Morley, (H10)	336
Morrice, (J11)	372
Moscow, (I12)	200
Mosherville, (I12)	500
Mount Clemens, (M11)	9,488
Mount Morris, (K10)	1,174
Mount Pleasant, (I9)	4,819
Muir, (I10)	363
Mulliken, (I11)	290
Munger, (K9)	200
Munising, (G3)	5,037
Munith, (I12)	250
Muskegon, (J12)	36,570
Muskegon Heights, (F10)	9,514
Nadeau, (F4)	980
Nahma, (G4)	720
Napoleon, (J12)	370
Nashville, (H11)	1,376
National Mine, (E3)	720
Naubinway, (J3)	250
Negaunee, (E2)	7,419
Newaygo, (G10)	1,160
New Baltimore, (M11)	974
Newberry, (I3)	2.172
New Boston, (L12)	300
New Buffalo, (E13)	496
New Era, (F9)	410
New Haven, (M11)	535
New Lothrop, (J10)	425
Newport, (L13)	450
New Troy, (E13)	340
Niles, (F13)	7,311
No. Adams, (I13)	414
No. Branch, (L10)	645
No. Detroit, (L12)	250
No. Muskegon, (F10)	630
Northport, (G6)	507
Northstar, (J10)	300
Northville, (K12)	1,738
Norway, (E4)	4,533
Nottawa, (H13)	300
Novi, (L12)	300
Nunica, (F10)	225
Oakgrove, (J11)	200
Oakley, (J10)	201
Oakwood, (L12)	1,990
Ojibway, (D1)	240
Okemos, (I11)	250
Old Mission, (G7)	200
Olivet, (H11)	500
Omer, (K8)	266
Onaway, (J6)	2,789
Onekama, (F8)	252
Onondaga, (I12)	400
Onsted, (J12)	323
Ontonagon, (B2)	1,406
Orion, (L11)	929
Ortonville, (L11)	445
Osceola, (C1)	200
Oscoda, (L8)	864
Osseo, (I13)	390
Otisville, (K10)	364
Otsego, (G12)	3,168
Ottawa Lake, (K13)	210
Otter Lake, (L10)	325
Overisel, (G11)	200
Ovid, (J10)	1,067
Owendale, (L9)	274
Owosso, (J11)	12,575
Oxford, (L11)	1,668
Paines, (J10)	210
Painesdale, (C2)	850
Palatka, (C3)	900
Palmer, (E3)	850
Palms, (M9)	300
Palmyra, (K13)	230
Palo, (I10)	330
Paris, (H9)	225
Parma, (I12)	564
Parshallville, (K11)	400
Paw Paw, (G12)	1,556
Pearlbeach, (M11)	200
Peck, (M10)	341
Pellston, (I5)	915
Pentoga, (C3)	300
Pentwater, (E9)	956
Perkins, (F4)	400
Perrinton, (I10)	419
Perry, (J11)	734
Petersburg, (K13)	514
Petoskey, (H6)	5,064
Pewamo, (I10)	316
Pickford, (L3)	400
Pigeon, (L9)	780
Pinckney, (J11)	384
Pinconning, (J9)	769
Pinnebog, (L9)	200
Pittsford, (I13)	550
Plainfield, (J11)	210
Plainwell, (G12)	2,049
Plymouth, (K12)	2,857
Point Mills, (D1)	200
Pokagon, (F13)	300
Pompeii, (I10)	300
Pontiac, (L11)	34,273
Port Austin, (L8)	410
Port Hope, (M9)	353
Port Huron, (L10)	25,944
Portland, (I11)	1,899
Potterville, (I11)	330
Powers, (E4)	249
Prairieville, (H11)	250
Prattville, (I13)	300
Prescott, (J8)	600
Prosper, (H8)	200
Pulaski, (I12)	250
Quincy, (I12)	1,251
Quinnesec, (D4)	380
Raco, (K3)	395
Ramsay, (A3)	700
Ransom, (J13)	200
Rapid City, (H7)	200
Rapid River, (G4)	660
Ravenna, (F10)	610
Reading, (I13)	1,036
Redford, (L12)	1,389
Red Jacket, (D1)	2,390
Redridge, (C1)	400
Reed City, (H9)	1,803
Reese, (K10)	469
Remus, (H9)	610
Republic, (D3)	1,850
Rexton, (J3)	300
Richland, (H12)	283
Richmond, (M11)	1,303
Richmondville, (M9)	200
Richville, (K10)	250
Ridgeway, (K12)	300
Riga, (K13)	250
Riggsville, (I5)	200
Riley Center, (M11)	200
Riverdale, (I10)	400
Riverrouge, (L12)	9,822
Rives Junction, (I12)	200
Rochester, (L11)	2,549
Rockford, (G10)	1,143
Rockland, (B2)	1,009
Rockwood, (L12)	500
Rodney, (H9)	220
Rogers, (K6)	2,109
Romeo, (L11)	2,102
Roscommon, (I8)	357
Rosebush, (I9)	350
Rose City, (J8)	331
Roseville, (M12)	500
Rothbury, (E9)	200
Royal Oak, (L12)	6,007
Rumely, (F3)	200
Saganing, (J9)	300
Saginaw, (J10)	61,903
Sagola, (D3)	360
St. Charles, (J10)	1,469
St. Clair, (M11)	3,204
St. Clair Heights, (L12)	2,000
St. Ignace, (I5)	1,852
St. Jacques, (G4)	300
St. James, (G5)	250
St. Johns, (I10)	3,925
St. Joseph, (E12)	7,251
St. Louis, (I10)	3,036
Saline, (K12)	830
Sand Lake, (G10)	366
Sandusky, (M10)	1,228
Saranac, (H11)	750
Saugatuck, (F11)	526
Sault Sainte Marie, (L3)	12,096
Sawyer, (E13)	300
Schaffer, (F4)	200
Schoolcraft, (G12)	731
Scofield, (K12)	230
Scotts, (H12)	350
Scottville, (F9)	1,045
Sebewaing, (K9)	1,446
Shaftsburg, (J11)	300
Shelby, (F9)	1,288
Shelldrake, (J2)	320
Shepherd, (I9)	823
Sheridan, (H10)	489
Sherman City, (H9)	250
Sherwood, (H12)	250
Shingleton, (H3)	220
Silverwood, (L10))	200
Sixlakes, (H10)	280
Skanee, (D2)	270
Slocum, (L12)	240
Smyrna, (H10)	240
Somerset Center, (J12)	200
So. Boardman, (H7)	600
So. Haven, (F12)	3,829
So. Lyon, (K12)	615
So. Range, (C1)	1,435
So. Rockwood, (L13)	320
Sparta, (G10)	1,502
Spring Arbor, (I12)	250
Springlake, (F10)	978
Springport, (I12)	535
Springwells, (L12)	1,150
Spruce, (L7)	340
Stambaugh, (C3)	2,263
Standish, (K9)	795
Stanton, (H10)	862
Stanwood, (H9)	273
Stephenson, (E5)	550
Stevensville, (E12)	206
Stittsville, (H8)	200
Stockbridge, (J11)	749
Stonington, (G4)	420
Stronach, (F8)	380
Sturgis, (H13)	5,905
Sumner, (I10)	300
Sunfield, (I11)	456
Suttons Bay, (G6)	392
Tawas City, (L8)	1,018
Tecumseh, (J12)	2,432
Tekonsha, (H12)	569
Temperance, (L13)	200
Temple, (I8)	300
Thomas, (L11)	400
Thompson, (H4)	250
Thompsonville, (G7)	410
Thornville, (L11)	250
Three Oaks, (E13)	1,362
Three Rivers, (G13)	5,209
Tower, (J6)	545
Traverse City, (G7)	10,925
Trenton, (L12)	1,682
Trimountain, (C1)	2,620
Trout Creek, (B2)	600
Troutlake, (K3)	250
Trufant, (H10)	390
Turner, (K8)	236
Tuscola, (K10)	260
Tustin, (H8)	281
Twining, (K8)	221
Ubly, (L9)	455
Union City, (H12)	1,268
Unionville, (K9)	488
Utica, (M11)	588
Vandalia, (G13)	331
Vanderbilt, (I6)	394
Vassar, (K10)	1,453
Vermontville, (H11)	585
Vernon, (J11)	417
Vestaburg, (I10)	440
Vicksburg, (G12)	1,712
Victoria, (B2)	420
Vriesland, (F11)	250
Vulcan, (E4)	2,100
Wacousta, (I11)	200
Wakefield, (A3)	4,151
Waldenburg, (M11)	350
Waldron, (I13)	457
Walkerville, (F9)	252
Walloon Lake, (H6)	300
Waltz, (K12)	250
Warren, (L11)	326
Washington, (L11)	230
Washington Heights, (H12)	1,245
Waterford, (L11)	250
Waters, (I7)	200
Watersmeet, (B3)	400
Watervliet, (F12)	1,073
Watrousville, (L10)	250
Waucedah, (E4)	250
Wayland, (G11)	853
Wayne, (K12)	1,899
Webberville, (J11)	465
Weidman, (H9)	500
Wells, (E4)	1,520
W. Bay City, (J9)	Pop. inc. in Bay City
W. Branch, (J8)	1,105
Weston, (J13)	216
Westphalia, (I11)	325
Wetmore, (F3)	330
Wetzell, (H7)	250
Wexford, (G7)	250
Wheeler, (I10)	250
Whitecloud, (G9)	618
Whitehall, (F10)	1,230
White Pigeon, (G13)	887
Whitmore Lake, (K12)	350
Whittemore, (K8)	232
Williamston, (J11)	1 060
Wilson, (E4)	520
Winn, (H9)	250
Winters, (F3)	200
Wixon, (K11)	200
Wolverine, (I6)	413
Woodland, (H11)	356
Wyandotte, (L12)	13,851
Yale, (M10)	1,223
Ypsilanti, (K12)	7,413
Zeeland, (F11)	2,275
Zilwaukee, (J9)	920

Its annual output in 1919, valued at $3,466,188,000, gave it seventh place in the United States. The following table gives a comparative view of progress by decades since 1850:

YEAR	Number of establishments	Capital	Wage earners	Total wages	Cost of materials	Value of products
1850	2,023	$6,563,660	9,344	$2,717,124	$6,136,328	$11,169,002
1860	3,448	23,808,226	23,190	6,735,047	17,635,611	32,658,356
1870	9,455	71,712,283	63,694	21,205,355	68,142,515	118,394,676
1880	8,873	92,930,959	77,591	25,513,682	92,900,269	150,715,025
1890	12,127	262,412,240	148,674	54,982,906	154,521,918	277,896,706
1900	16,807	284,097,133	162,355	66,467,867	199,559,905	356,944,082
1909	9,159	583,946,965	262,111	153,838,044	368,612,022	685,109,169
1919	8,305	2,340,954,312	471,242	639,708,093	1,919,243,243	3,466,188,483

In the 10 years, 1899–1909, Michigan had a higher per cent of gain in value of manufactures than any State which surpassed it in total value of output. In 1919 it had 42 industries, each of which put out a total product valued above $10,000,000. The bulk of the total product is produced in the southern 20 counties, where are employed over three-fourths of the men. Michigan's rapid growth in manufactures is due primarily to abundant resources in timber, iron and copper and cheap water transportation; its rapid growth in variety of manufactures since 1890 is due to the release of capital from lumbering and the development of the automobile industry, in which Michigan now leads all the States. Outside of Detroit, which is the centre, the leading Michigan cities in the manufacture of automobiles, are Flint, Lansing, Pontiac and Jackson. This industry has stimulated a great variety of associated manufactures. The manufacture of lumber and timber products is the chief industry of cities in the northern part of the lower peninsula and in the upper peninsula except in the mining centres. Of the timber products, the chief are paper pulp, shingles and lath, charcoal and chemicals, veneer, tanbark, turpentine and rosin, and a great variety of wooden-ware. Foundry and machine-shop products, which rank ahead of furniture, are made chiefly in the large cities in the southern part of the State. Flour and gristmill products rank 14th and are widely distributed. The food industry is confined chiefly to Detroit, Battle Creek and the west central part of the lower peninsula. Furniture ranks sixth; over 170 furniture plants are distributed in over 30 important centres, among which Grand Rapids and Detroit lead. Detroit has about one-third as much capital invested as Grand Rapids. The chief factors in Grand Rapids' supremacy have been the initial impulse from the abundance of pine timber, the investment of capital since the decline of lumbering, skilled labor, facilities for marketing and the early organization of the industry on modern business lines. The Furniture Fair held there twice a year is a centre of interest to all the States and to foreign countries. . Supplies accessory to printing and publishing are an important industry. Leather goods and tobacco goods are also made in large quantities. Detroit is the chief centre for all kinds of structural materials, including stoves and furnaces, also for clothing and its accessories, particularly furs. It is also the chief centre for shipbuilding and for drugs and medicines. Michigan ranks first among the States in the manufacture of automobiles, salt, drugs and refrigerators; second in furniture and third in beet-sugar.

Transportation and Commerce.— The first means of transportation used, common wagon roads, have been the last to be thoroughly improved. The State now has about 70,000 miles of dirt roads, partly improved. The automobile has been most effective in strengthening the "good roads" movement. In 1905 was created the State highway department, which has expended about $1,000,000 in money awards to encourage townships in their common road building. Among the most important improvements is a State road along the entire shore line of the lower peninsula, which is partly completed. At the spring election, 1919, Michigan voted to bond the State for $50,000,000 for good roads. Railroad building began in Michigan shortly after Stevenson experimented with the "Rocket." The first road built, the Erie and Kalamazoo, from Toledo (then in Michigan) to Adrian, was the first west of the Appalachian Mountains. The first State constitution, adopted in 1835, provided for a system of internal improvements, in which three transpeninsular railroads were included; of these, the Michigan Central was partly built by the State, but was completed to Chicago by private capital in 1852. The census of 1920 shows 9,927 miles of steam roads, and 976 miles of electric roads, with a total investment of $141,875,000, employing about 80,000 men. Nine trunk lines cross the State from east to west and three from north to south. The chief railroad centres are Detroit, Jackson, Grand Rapids, Saginaw, Kalamazoo and Lansing. The topography of the lower peninsula has favored a general distribution of roads, through a system of intersecting morainal valleys. In the western end of the upper peninsula is the only portion of the railway system of the State with steep grades. The leading lines are the Michigan Central, the Chicago and Grand Trunk, the Grand Rapids and Indiana, the Lake Shore and Michigan Southern, the Père Marquette and the Duluth, South Shore and Atlantic. Connecting with these railroads are the several large steamship lines of the Great Lakes. In general, the lake traffic is confined to a few of the heaviest and bulkiest commodities — iron ore, copper, lumber, grain and coal. The tonnage of this traffic is one-third the total tonnage of ships owned in the United States. The tonnage of the Detroit River is five times the foreign tonnage of New York Harbor and exceeds the combined tonnage of Hamburg, Liverpool and London. About four-fifths of the through freight on the Lakes passes through the «Soo» Canal. Vast sums have been spent by the State and by the National government, in improving the Great Lakes harbors, especially at Cheboygan, Alpena, Saginaw, Saint Joseph and Grand Haven, and the channels through the Saint Mary's River, the Detroit River and the Saint Clair Flats; 45 life-saving stations and 120 lighthouses and flag-signal stations are maintained.

Government.— Michigan has had three constitutions, adopted in 1835, 1850 and 1908. Constitutional development in Michigan has been in the direction of restricting and defining the powers conferred upon the State government. The last constitution, which went into effect 1 Jan. 1909, contains a declaration of rights in 21 sections. Amendments to it may be proposed in either house of the legislature and by a two-thirds vote may be referred to the people, who may adopt by majority vote; amendments may also be initiated by signature of at least 10 per cent of the electorate. At the general election in 1926 and in each 16th year thereafter the question of a general revision of the constitution is to be submitted to the electorate. The elective franchise is conferred upon every citizen of the United States 21 years of age or over who has resided six months in the State and in the township or ward in which he offers to vote 20 days next preceding an election. Before the passage of the equal suffrage amendment women, who had the qualifications of male electors and property assessed for taxes in any part of the district or territory to be affected, might vote at such election on any question involving the direct expenditure of public money or the issue of bonds.

The seat of government is at Lansing. The legislative department consists of a senate of 32 members and a house of representatives of 100 members; the lower house may not consist of more than 100 nor less than 64 members. A newly elected legislature meets in every odd-numbered year, on the first Wednesday in January. Membership in both houses is reapportioned every 10 years — last in 1923 — upon the basis of the preceding national census. All legislation is by bill, and every bill to become a law must receive the assent of a majority of the members elected to each house; a two-thirds vote is requisite for bills appropriating the public funds; by a two-thirds vote the legislature may pass a bill over the governor's veto; all other bills, to become law, require the governor's signature. At special sessions the legislature can consider only such subjects as are named either in the governor's proclamation or in his message. The constitution of 1909 reserves to the people the power of the initiative and the referendum.

The officers of the executive department are a governor, lieutenant-governor, secretary of state, treasurer, auditor-general and attorney-general. All are elected for two years. The governor, in whom is vested the chief executive power, must be at least 30 years of age, five years a citizen of the United States and a resident of the State two years next preceding his election. His salary is fixed by the constitution at $5,000 a year. In case of vacancy, the office is filled by the lieutenant-governor, who is ex officio president of the senate. The governor may veto any bill within 10 days (Sundays excepted) of its presentation by the legislature. The appointive power of the governor is limited to minor officials.

The judicial power is vested in a Supreme Court, Circuit Courts, probate courts, justices of the peace and inferior courts established by the legislature. The Supreme Court consists at present of one chief justice and seven associate justices, two members being elected every two years for a term of eight years, at a salary of $7,000 a year. The court holds four terms a year in Lansing. Each of the 39 Circuit Courts holds four terms a year, respectively, in each county within its circuit; each Circuit Court has one judge, elected for a term of six years at a salary of $3,500. In each county a probate judge is elected for a term of four years; probate courts have, in addition to usual duties, original jurisdiction in all cases of juvenile delinquents and dependents. Justices' courts are established in the townships, presided over by justices of the peace, four in each township, elected for a term of four years.

In each of the 84 counties, a board of supervisors is elected by townships and city wards. Other officers are elected annually in April, generally for a term of two years. Owing to the large number of cities and villages — nearly 100 cities and over 300 inoorporated villages — township government is of minor importance; the cities are in general governed by special charters.

Banking.— The first bank in Michigan was a private bank, established in 1806, in Detroit. By the time Michigan was admitted to the Union (1837), there were 15 banks, with an aggregate actual capital of less than $1,500,000. President Jackson's specie circular precipitated a national crisis, which was met in Michigan by a general banking law, of such a nature that the State was soon dotted with «wild-cat» banks, without capital paid in, with excessive issue of notes, and without, in most instances, either ability or intention to redeem them. In 1844, this banking law was declared unconstitutional and provision was made in the new constitution in 1850 that no general banking law could be enacted without first receiving the approval of a majority of the electors of the State. The constitution of 1909 provides that such law, to be valid, must receive a two-thirds vote in the legislature. Under the present law, a State bank must have a capital stock of at least $20,000 in cities of 1,500 inhabitants, and not less than $250,000 in all cities of over 110,000. At least 15 per cent of the deposits of commercial and savings banks must be kept on hand and every stockholder is liable. A State banking department, at the head of which is a commissioner appointed by the governor for a term of four years, exercises general supervision over all banks in the State.

Finance and Taxation.— In 1837 the first State legislature authorized a loan of over $5,000,000 for public improvements, most of which was placed with eastern companies which soon afterward failed. In 1846 the State sold its improvements, realizing sufficient money to

The State Capitol at Lansing

maintain its credit; but of this debt there still remained at the beginning of the Civil War $2,316,328. The war debt increased the amount to $3,880,399. It was not wholly liquidated until a short time previous to 1900. A loan of $500,000, made in 1898 on account of the war with Spain, has also been paid. The constitution of 1909 provides that no debt shall be contracted by the State in excess of $250,000, except to suppress insurrection or repel invasion.

In 1922 the assessed valuation, real and personal, of the State was $5,483,535,114; in 1916, the State board of equalization placed the equalized value of the State at $2,800,000,000, which was a cut of $280,000,000 from the estimate of the State tax commission. Of this amount, 29 per cent was assessed to Wayne County ($836,000,000). In addition to a property tax, the State levies certain indirect taxes, which yield about one-tenth of the total revenue. The direct tax is spread by the auditor-general among the various administrative districts, which levy and collect, at the same time with the State tax, the taxes for the counties, townships, villages, cities and highway labor. The moneys collected for the State are disbursed principally for the expenses of the State government and the maintenance of State institutions, including the State colleges and the University of Michigan. For the year ending 30 June 1922 the State's revenue and expenditures were as follows:

Balance 1 July 1921	$19,834,661
Receipts, 1921–1922	103,072,192
Total	$122,906,853
Disbursements, 1921–1922	95,438,958
Balance, 1 July 1922	$27,467,895

Corrections and Charities.— State penal and charitable institutions are under the Michigan State board of corrections and charities, established in 1871. This is an unpaid board of five members, one of whom is the governor ex officio, who appoints the other four, for a term of eight years; one retires every two years. During the year ending 30 June 1916 the board held 20 meetings, 16 of which were at State institutions, in conference with the local board in immediate control; in general, the local boards consist each of three members appointed by the governor and are unpaid. The oldest penal institution is the State prison at Jackson, established in 1838. In 1885 a branch prison was established at Marquette, in the Upper Peninsula. Minor offenders are sent to the reformatory at Ionia, established in 1877. The total population of all of these is about 2,000. The cost of maintenance is about $300,000 a year, which is about half defrayed by receipts from prison industries. Progress is being made in prison management; the indeterminate sentence has been adopted, and a pardon board of four members, appointed by the governor, reports to him upon all petitions for pardon. Allied to the prisons in nature, is the Industrial School for Boys at Lansing (estab. 1855), and the Industrial Home for Girls at Adrian (estab. 1879), containing together about 1,000 inmates. County superintendents of the poor are required to send all neglected dependent children to the State Public School at Coldwater (opened 1874). The Soldiers' Home at Grand Rapids (estab. 1885) cares for Michigan soldiers of recent wars. The Asylum for the Insane at Kalamazoo was opened in 1859; in 1877 a similar institution was established at Pontiac, and in 1893 at Newberry, in the upper peninsula; there is one also at Traverse City (estab. 1881). These four institutions contain over 4,000 patients. At Ionia was established in 1885 the Asylum for Dangerous and Criminal Insane. At Lapeer is the State Home and Training School for the feeble-minded, and at Wahjamega (Tuscola County) is the Farm Colony for Epileptics; the division between these two classes has been only recently made, both classes having been cared for at Lapeer since 1893. The School for the Deaf and Dumb is at Flint (estab. 1854); the School for the Blind is at Lansing (estab. 1879); these were formerly together at Flint. At Saginaw is maintained an employment institution for the blind (estab. 1903).

Education.— The constitution of 1909 contains (Art. XI, Sec. 1) the well-known clause from the Ordinance of 1787: «Religion, morality and knowledge being necessary to good government and the happiness of mankind, schools and the means of education shall forever be encouraged.» At the head of Michigan's school system is the superintendent of public instruction, elected in April of odd-numbered years, for a term of two years; salary $4,000 a year. He is ex officio member and secretary of the State board of education; three other members are elected, one at each biennial spring election, to hold office six years. The board has general supervision of the State normal schools, examines textbooks on the subject of physiology and hygiene offered for use in the public schools, and conducts examinations for teachers' life certificates. In its general outline, Michigan's educational system, which it owes to its first superintendent of public instruction, John D. Pierce (1836–41), has been used as a model in nearly all the western States. Its distinctive features are universal education in common free schools with compulsory attendance, training for teachers in normal schools, and higher education in colleges and a State university. These schools are supported partly from the interest derived from the sale of school and university lands, partly by legislative appropriations. Immediately under the superintendent of public instruction there is now elected in each county a county school commissioner, who, with two county examiners, examines and licenses teachers. In some counties there are townships organized as single school districts, which may support a high school in addition to a common school; but, in general, the townships are divided into districts, by a township board of three (two elected school inspectors and the township clerk), who also exercise general supervision; each district is under its own elected board of three members. Most villages and cities support high schools.

Teachers are trained in four normal schools: the State Normal College at Ypsilanti and three others at Mount Pleasant, Marquette and Kalamazoo. Higher and special education is provided at the Michigan Agricultural College at East Lansing; the Michigan College of Mines at Houghton; and the University of Michigan at Ann Arbor. The Agricultural College is the oldest in the United States (estab. 1850) and is under control of an elected State board of agriculture. The College of Mines (estab. 1885) is under a board appointed by the governor. The University (estab. 1837) is under control of an elected board of regents. Besides the State educational system for higher education there are several denominational colleges, at Albion and Adrian (Methodist), at Hillsdale and Kalamazoo (Baptist), at Olivet (Congregational), at Holland (Dutch Reformed), at Alma (Presbyterian), and at Detroit (Catholic).

According to 'Statistical Survey of Education, 1919–20,' a bulletin issued by the Bureau of Education, Department of the Interior, there were 605,877 pupils receiving elementary instruction in public schools in Michigan in 1920, and 76,497 pupils in private schools. In the same year there were 84,438 pupils receiving secondary instruction in public high schools and 6,539 in private schools. The same report showed 18,886 students receiving higher instruction in public institutions and 3,124 students in private institutions of higher learning. This was a grand total of 795,361, of whom 709,201 were being educated at public expense and 86,160 in private institutions. Of the 18,886 students receiving higher instruction, 11,408 were enrolled in universities, colleges and professional schools and 7,478 in teachers' colleges and normal schools. Of the 3,124 students in private institutions of higher education, 2929 were in universities, colleges and professional schools and 195 in teachers' colleges and normal schools. The percentage in daily attendance was 59.8.

History.— The Indians who originally occupied Michigan were principally the Ojibwas (Chippewas), the Ottawas and the Potawatomis; minor tribes were the Hurons (Wyandots), and the Sacs and Foxes. In historic times, the Ojibwas have been principally identified with the upper peninsula, the Ottawas and Potawatomis with the Lake Michigan shore of the lower peninsula, and the minor tribes with the region between Saginaw Bay and Detroit.

The first white men to visit Michigan were the missionaries and the explorers and traders, who came from the French settlements of the Saint Lawrence Valley in Canada. The route by which they came, and by which the traffic with the Indians was carried on until the discovery of the waters connecting Lakes Huron and Erie was over the Ottawa River, Lake Nipissing, the French River and the Georgian Bay. Jean Nicolet, in whose honor a bronze tablet was erected on Mackinac Island in 1915, was the first white man to pass through the Straits of Mackinac (1634). He was an agent of Champlain, then governor of Canada, who in the interests of trade sent him to find a passage to the South Sea. Nicolet apparently penetrated as far as central Wisconsin. The Jesuit missionaries followed close upon this lead. In 1641, Fathers Jogues and Raymbault preached to the Ojibwas at Sault Sainte Marie. The first permanent settlements were made by Fathers Dablon and Marquette, in 1668 and 1671, at Sault Sainte Marie and Michilimackinac (Saint Ignac). In 1701, Antoine de la Motte Cadillac (q.v.), who had been commandant of the French fort at Michilimackinac, founded Detroit. The Treaty of Paris in 1763, closing the struggle between France and Great Britain for possession of the continent, all of Canada, with the Great Lakes region, passed from French dominion; the frontier posts had already been garrisoned with British troops, soon after the capitulation of Montreal, in 1760. The Indians, who were friends of the French, and who underestimated the power of the British, believed that a united and determined resistance could drive the British from the continent, and under the leadership of the great Ottawa chieftain, Pontiac, made a simultaneous attack in 1763 upon the British posts from the Straits of Mackinac to western New York. Fort Mackinac, on the south side of the Straits, was captured, and all but a few of the garrison massacred. Pontiac himself conducted the siege of Detroit, but unsuccessfully, and finally the Indians were everywhere defeated.

The British held possession of Michigan until the Jay Treaty of 1796, although the Treaty of Paris (1783), closing the War of the Revolution, had ceded it to the United States. Previous to that war the Quebec Act (q.v.) of 1774 applied to the government of Michigan as well as to Canada. The population increased but slightly; a few British merchants and traders came to Detroit, and a few families settled on the shore lands above and below that point. At the outbreak of the Revolution, Henry Hamilton was appointed lieutenant-governor at Detroit, by whom supplies of tomahawks and scalping knives were distributed liberally among the Indians, and whose reports to General Carleton of the success of scalping expeditions in the settlements sufficiently characterize his administration. The retention of the posts at the close of the war was alleged to be justified on several grounds; among the real reasons was the desire to retain control of the rich fur trade. The policy of giving presents to the Indians was long continued. In 1787 the military force at Detroit was increased by two full regiments, the fortifications were strengthened, and large supplies of presents were distributed among the Indians, which so increased their hostility against the American settlements that the United States Government had to send troops against them; first under General Harmer who was defeated in 1790; then under General St. Clair who was also defeated in 1791; and finally, under Gen. Anthony Wayne, whose force was of sufficient strength to insure victory. On 20 Aug. 1794 Wayne defeated the combined force of British and Indians at the Battle of Fallen Timbers. By the Treaty of Grenville, 3 Aug. 1795, the Indians ceded a large strip of Michigan land, six miles wide and extending from Lake Saint Clair to the Raisin River, also Mackinac Island, Bois Blanc Island, and other important lands. Following these successes came the treaty negotiated by John Jay with Great Britain in 1796, according to a stipulation in which the British garrison was withdrawn from Detroit, 16 June 1796; on 11 July a detachment of United States troops took possession.

One of the earliest acts of the new Federal Government was to organize a territorial government for the Great Lakes region. The "Ordinance of 1787," adopted for the Northwest Territory, provided a government in which a governor and three judges made laws, to be enforced by these judges as the highest court. It contained a guarantee of religious liberty, a bill of rights, a provision for general education, a declaration against human slavery, and the means of erecting new States from these lands. In 1800 the Territory of Indiana was erected, which included the western half of the Territory of Michigan and the eastern end of the upper peninsula; the remainder of both peninsulas was added in 1802. On 30 June 1805 the whole was separated into two Territories, Indiana and Michigan (the lower peninsula), and the Ordinance of 1787 was made the law of Michigan Territory. In 1800, Michigan's white population was 3,206, which in 10 years increased to 4,762 people, of whom 1,650 were in Detroit. Detroit was the capital. President Jefferson had appointed as governor, William Hull, of Massachusetts, an officer of honorable service in the Revolution, but now of advanced age, and temperamentally unfitted to be the chief officer of a frontier settlement.

In 1807, by the Treaty of Detroit, Hull secured from the Indians the cession of a large area of land in southeastern Michigan; but by 1809 the Indians had begun to realize the serious meaning of the treaty, and to make trouble which he was unable to quiet. The battle of Tippecanoe, 7 Nov. 1811, in which Gen. William Henry Harrison defeated the Indians near Lafayette, Ind., drove them over to the British, and made Michigan the scene of the opening campaign of the War of 1812. In December 1811, Hull went personally to Washington, to beseech Congress to strengthen Michigan's defences, but he unwisely accepted personal command of a force which was much too small for the purpose. In the following war, which was declared against Great Britain, 18 June 1812, Mackinac was captured by the British on 17 July, which Hull deemed decisive as to the control of the Great Lakes. The arrival of British reinforcements before Detroit, under the British General Brock, demanding surrender, together with the threatening possibility of an Indian massacre similar to that at Mackinac in 1763, decided Hull to comply with the British demands (16 Aug. 1812) to the indignation of his soldiers and of the nation. It is still believed that he might have been able to resist an immediate attack, and that he would have been speedily reinforced; at the time he was court-martialed, and sentenced to be shot, but was pardoned by President Jefferson on account of his honorable record in the Revolution. The immediate result of the surrender was to place the settlements at the mercy of the Indians. On 23 Aug. 1813, following the capture of General Winchester at Frenchtown on the Raisin River, the Indians, with scarcely any restraint from the British General Brock, foully massacred nearly the entire garrison (see FRENCHTOWN, BATTLE OF). The victory of Commodore Perry on Lake Erie (10 Sept. 1813) which made possible that of General Harrison on the river Thames (5 Oct. 1813) restored Michigan to the United States.

On 13 Oct. 1813, Lewis Cass, who had served as a brigadier-general under Harrison, was appointed governor of Michigan Territory, and until 1831, when he was appointed a member of Andrew Jackson's Cabinet, his exceptional talents were used for the upbuilding of the commonwealth. His intimate knowledge of Indian character was specially useful in weaning the tribes from their British sympathies and gaining their respect for the United States government. By the Indian treaties of 1819 and 1821 he secured the cession of large areas of land adjacent to and including the Saginaw and Grand River valleys. In 1836 the Indians ceded practically all the remaining portion of the Lower Peninsula, and the eastern half of the Upper Peninsula; and before 1840 they had been removed to Western reservations. With the first public land sales at Detroit in 1818, the beginning of steam navigation on the Great Lakes, the opening of an all-water route to the Atlantic seaboard through the Erie Canal in 1825, the settlement of Michigan made rapid strides, especially in the closing years of the Territorial period, which brought the population from 31,639 in 1830 up to 87,273 in 1837.

The admission of Michigan to the Union was delayed by a dispute with Ohio about Michigan's southern boundary. In 1835 the people of Michigan adopted a State constitution, elected a complete set of State officers and later this constitution of 1835 was accepted by Congress without readoption; the original delegate was seated in Congress without re-election, and the original State officers continued to serve without re-election after the formal admission of the State by Congress (26 Jan. 1837). From 1 Nov. 1835 Michigan was *de facto* a State, though not technically a State in the Union. The boundary question was settled in 1837 in favor of Ohio, when Michigan acquired, as compensation for the loss on the south, the Upper Peninsula, then but little known. At the very outset, the State was seriously crippled by the financial panic of 1837, and the failure of Eastern companies with which the State had placed a $5,000,000 loan for public improvements. The improvement scheme, which involved the building of three trans-peninsular railroads, had to be abandoned, and the debt was not entirely paid until long after the Civil War. The improvements made, mainly on the Michigan Central and the Michigan Southern railroads, were carried on however by private enterprise, the former road being completed to Chicago in 1852. In 1850 a new State constitution was adopted, prohibiting the State to engage in any similar undertaking. In accordance with a provision of the constitution of 1835, the question of the permanent situation of the State capital was taken up by the legislature in 1847, with the result that it was located at Lansing. During the Civil War, Michigan put into the field nearly 100,000 men; among the many who won distinction for service was Gen. George Armstrong Custer (q.v.), leader of the famous Michigan Cavalry Brigade. Michigan's «war governor» was Austin Blair. In this period began the career of Zachariah Chandler, who served three terms as United States senator (1857–75). While Mr. Chandler was in the National Senate, Michigan had seven governors, all but one of whom served two terms.

Since the Civil War, Michigan has gained rapidly in population, wealth and prosperity. Agriculture has continued to be the leading industry in the southern peninsula, and mining in the northern; pine lumbering, in the years immediately following the war, developed to enormous proportions in lower Michigan, but is now carried on principally above the Straits. The conditions of labor have favored rapid immigration; only one serious strike has occurred in Michigan's history, in the Copper Country, in 1913. After the war there ensued a great activity in railroad building, aided by national and State land grants totaling nearly 6,000,000 acres. For the original Sault Sainte Marie Canal the national government granted 750,000 acres of land, and in 1881 assumed control on completion of the Weitzel lock, which it had constructed at a cost of more than $2,000,000. The establishment of public institutions has kept pace with the State's growth in material wealth, coming rapidly into existence between 1870 and 1885. Many subordinate departments of government have been organized as the administration of the State's affairs have become more complex. In 1879 a new capitol building at Lansing was completed and occupied. Legislation has been in the direction of a more equitable distribution of taxes, greater freedom in elections, and increased control of local government by municipalities. The system of «county option,» with high license, was in force until 1920, the State having repealed in 1876 the prohibition law of 1855. At various times the question of a general revision of the constitution has been submitted to the people, in 1867, 1874, 1892 and 1898, but defeated, until 1908, when a new constitution was adopted, which went into effect 1 Jan. 1909. In politics Michigan was strongly Democratic previous to the Civil War, until the formation of the Republican party in 1854, since which time Michigan has elected Republican governors, except in 1882, 1890, 1912 and 1914.

Governors of Michigan.

TERRITORIAL.

William Hull	1805–13
Lewis Cass	1813–31
George B. Porter	1831–34
Stevens T. Mason	1834–35
John S. Horner (acting)	1835

STATE.

Stevens T. Mason	Democrat	1835–40
William Woodbridge	Whig	1840–41
James W. Gordon (acting)	"	1841–42
John S. Barry	Democrat	1842–46
Alpheus Felch	"	1846–47
William L. Greenly (acting)	"	1847–48
Epaphroditus Ransom	"	1848–50
John S. Barry	"	1850–51
Robert McClelland	"	1851–53
Andrew Parsons (acting)	"	1853–55
Kinsley S. Bingham	Republican	1855–59
Moses Wisner	"	1859–61
Austin Blair	"	1861–65
Henry H. Crapo	"	1865–69
Henry P. Baldwin	"	1869–73
John J. Bagley	"	1873–77
Charles M. Croswell	"	1877–81
David H. Jerome	"	1881–83
Josiah W. Begole	Democrat and Greenback	1883–85
Russell A. Alger	Republican	1885–87
Cyrus G. Luce	"	1887–91
Edwin B. Winans	Democrat	1891–93
John T. Rich	Republican	1893–97
Hazen S. Pingree	"	1897–1901
Aaron T. Bliss	"	1901–05
Fred M. Warner	"	1905–11
Chase S. Osborn	"	1911–13
Woodbridge N. Ferris	Democrat	1913–17
Albert E. Sleeper	Republican	1917–21
Alex. J. Groesbeck	"	1921–

Population.— The first appreciable increase of Michigan's population came after 1818, when public lands came onto the market; but not until about 1835 was the increase rapid. It was checked by the financial panic of 1837, but was again on the increase by 1840. The first foreign immigration, especially from Germany, came with the revolutions of 1830 and 1848 in Europe; economic depression in Ireland caused an Irish exodus in the early half of the 19th century. Religious oppression in Holland brought a Dutch colony to western Michigan in 1846. Overcrowding in the countries of southern Europe has stimulated the Italian, Hungarian and Greek immigrations of recent years. Nearness to Canada has facilitated the coming of many Canadians since 1850. The French-Canadians began coming as early as 1701 to the shore lands about Detroit. Direct immigration from France has not occurred to any extent. The Germans are most numerous in southeastern Michigan about Ann Arbor and Saginaw. The strongest Dutch centres are Holland, Grand Haven and Grand Rapids. Poles are especially numerous in the «Thumb» and about Detroit, Grand Rapids, Bay City and Saginaw. The largest Italian colony in the Lower Peninsula is in Detroit; and in the Upper Peninsula at Calumet and Iron Mountain. The most numerous foreign-born population in the Upper Peninsula are the Finns, mainly in the mining regions. The Swedes and Norwegians are most numerous in the counties of Houghton, Delta, Dickinson and Gogebic. In the Copper Country there are many Cornishmen. In 1920 Michigan's total foreign-born whites numbered 726,635 or 19.8 per cent of the total population. Following are the number of foreign births by the principal countries represented (United States census):

Canada (French and others)	164,502
Germany	86,047
England	47,149
Poland	103,926
Sweden	24,707
Italy	30,216
Russia	45,313
Finland	30,096
Austria	22,004
Hungary	22,607
Netherlands	33,499

Of the total population of 3,668,412 in 1920, 3,601,627 were whites, 60,082 were negroes, 5,614 Indians, 792 Chinese, and 184 Japanese. The urban population numbered 2,241,560 and included 2,184,678 whites, 55,006 negroes and 1,876 Indians, Chinese, Japanese, etc. The rural population numbered 1,426,852 and included 1,416,949 whites, 5,076 negroes and 4,827 Indians, Chinese, Japanese, etc.

About one-third of the population of the Upper Peninsula is in the Copper Country, and another third in the vicinity of the iron mines. In the Lower Peninsula the population is largely in the southern counties, and densest in and about the largest cities. In the year 1920 Detroit contained over one-fourth of the population of the State. Since then its rate of gain has been vastly greater than that of most other cities. Lansing and Flint have risen far above the rank allotted them in 1910. The trend of population is at present, as it has been for over 20 years, away from the small villages and rural districts to the large cities, and, in general, there is a perceptible trend toward the northern and northwestern parts of the State. The general growth in population by decades from 1810 to 1920 is given in the following table:

1810	4,762
1820	8,896
1830	31,639
1840	212,267
1850	397,654
1860	749,113
1870	1,184,059
1880	1,636,937
1890	2,093,890
1900	2,420,982
1910	2,810,173
1920	3,668,412

Bibliography.— State publications; the most important above used are the reports and bulletins of the Geological and Biological Survey, Public Domain Commission, Railroad Commission, Board of Agriculture, Highway Department, Department of Public Instruction and Board of Corrections and Charities (consult for others, Bowker, R. R., STATE PUBLICATIONS); United States Census, 1910; ‹Michigan Historical Collections› (Lansing 1877–1915); ‹Michigan Political Science Association Publications› (Ann Arbor 1893–1905); ‹Legislative Manual› (Lansing 1915); Cooley, ‹Michigan› (American Commonwealth series, rev. ed., Boston 1905); Shelden, ‹The Early History of Michigan› (New York 1856); Lanman, ‹History of Michigan› (New York 1839); Farmer, ‹History of Detroit and Wayne County and Early Michigan› (Detroit 1890); Wood, ‹Geography of Michigan› (Kalamazoo 1914); McLaughlin, ‹Lewis Cass› (American Statesmen series, Boston 1892) and ‹Higher Education in Michigan› (Circular of Bureau of Education, Washington 1891); Cook, ‹Michigan, its History and Government› (New York 1905); Campbell, ‹Outlines of the Political History of Michigan› (Detroit 1876); Dilla, ‹The Politics of Michigan, 1865–1878› (New York 1912).

GEORGE N. FULLER.
Secretary Michigan Historical Commission.

MICHIGAN, Lake, in the northern part of the United States, the second in size of the Great Lakes (q.v.), and the largest body of fresh water lying wholly within the United States. It is bounded on the north and east by the State of Michigan, on the south by Indiana and on the west by Illinois and Wisconsin. Its outlet is Straits of Mackinac, through which its waters flow into Lake Huron (q.v.). The Mississippi is supposed to have been its outlet in ancient times; and now the lake is connected with this river by means of the Chicago Drainage Canal and the Illinois and Michigan Canal. Lake Michigan is a most important part of a great water system which furnishes transportation to the ocean for an extensive grain-growing and lumbering region. The lake is 581 feet above sea-level; its length from north to south is 316 miles; the average width 75 miles, the maximum depth, 875 feet and mean depth, 690 feet; area, 22,450 square miles; drainage area, 68,100 square miles. It is subject to violent storms, which are most destructive in the late autumn months. A lunar tidal wave shows itself in a slight degree. The shore-line of the southern part of the lake, east and west, is regular, but that of the northern part, east and west, has a number of indentations many of which form good harbors. At the mouths of rivers which flow into the lake there are good harbors. Nearly the whole extent of coast is low, most of it sandy; the Michigan coast has some high bluffs and considerable rocky shore-line. Green Bay on the west, indenting Wisconsin, is the largest bay; and Grand Travers Bay, on the east indenting the coast of Michigan, is the next in size. Another important inlet on the east is Little Travers Bay. Big Noquet and Little Noquet are inlets from Green Bay. The chief harbors, which are formed by mouths of rivers, are Chicago, Milwaukee and Grand Haven. Escanaba and several other good harbors are on the shores of Green Bay (q.v.). There are few islands in the southern part of the lake, all small and near the coast. At the entrance to Green Bay there is a group of islands, the largest of which is Washington. The Manitou (q.v.) group, in the northern and northeastern part of the lake, has several good-sized islands; the largest, Beaver, is about 52 miles long.

The chief rivers which flow into the lake are the Ford, Escanaba and Manistique from the north; the Manistee, Père Marquette, Muskegon, Grand, Kalamazoo and Saint Joseph from the east. The Fox and the Menominee enter the lake through Green Bay.

The chief cities on the lake are Chicago in Illinois and Milwaukee in Wisconsin. Other important cities are Kenosha, Racine and Manitowoc (Wis.), Manistee, Ludington and Grand Haven (Mich.), and Michigan City (Ind.). The navigation on Lake Michigan is most extensive and important. In the upper waters, or the southern part, navigation continues nearly all the year, but in the northern part navigation is closed about four months on account of the ice in the Straits of Mackinac. Large shipments of lumber are sent by way of the lake from northern Michigan and Wisconsin to Milwaukee and Chicago, and a vast amount of wheat and corn of the Mississippi Valley is sent east through Chicago and over Lake Michigan. Large mineral shipments are made. The fisheries of the lake are most important. The lake trout and whitefish of Lake Michigan are sent, fresh and canned, to all the large markets of the vicinity and to the Eastern markets.

The early missionaries and traders traversed the waters of this lake. In 1634 Jean Nicolet, an agent of Champlain (q.v.), visited the northern part of the lake, entered Green Bay and partially explored the Fox River. Father Marquette (q.v.) visited this lake and established mission stations on its shores. La Salle (q.v.) and Father Hennepin (q.v.) in 1679 made their famous voyage on this lake, and La Salle built a fort at the mouth of the Saint Joseph River.

MICHIGAN, University of, chartered in 1837 and first opened at Ann Arbor in 1841. It is a part of the public educational system of the State and is under the control of a board of regents elected for eight years by popular vote. The law of 1837 establishing the university provided for three departments, namely, literature, science and the arts, law and medicine. The curriculum has since been enlarged till the organization now includes eight departments: (1) Literature, science and the arts; (2) engineering and architecture; (3) medicine and surgery; (4) law; (5) the College of Pharmacy; (6) the Homœopathic Medical School; (7) the College of Dental Surgery, and (8) the Graduate School. The College of Literature, Science and the Arts offers courses in language and literature, history, philosophy, science and the liberal arts, and includes special curricula in journalism, business administration, insurance and statistics, chemistry, forestry and landscape design, as well as combined curricula leading to degrees in letters and law, letters and medicine and letters and dental surgery: the degrees conferred are bachelor of arts and of science. The colleges of engineering and architecture offer courses in civil, chemical, mechanical, electrical and marine engineering, aeronautics, conservation engineering, naval architecture, architecture and architectural engineering, and confers the degrees of bachelor of engineering and of architecture. Other degrees conferred by the university are as follows: Doctor of medicine in the Medical School and in the Homeopathic Medical School; bachelor of laws, juris doctor and master of laws in the Law School; pharmaceutical chemist, and bachelor of science (in pharmacy), in the College of Pharmacy; and doctor of dental surgery and doctor of dental science in the College of Dental Surgery. Advanced work in all lines is carried on in the Graduate School, leading to the degrees of master and doctor of arts, of science and of public health, and civil, electrical, mechanical and marine engineer. There are summer sessions in the colleges of Literature, Science and the Arts, Engineering and Pharmacy, and in the Medical, Law and Graduate schools. A summer engineering camp and a biological station are maintained on lands owned by the university in northern Michigan. The regulation of the affairs of each department is in the hands of the faculty of that department; there is also a university senate which considers matters of common interest. The standard of scholarship at the university is high, and it has long ranked among the foremost of State universities. The system of inspecting and accrediting secondary schools and admitting their recommended graduates originated at this university in 1870 under the acting presidency of Henry Simmons Frieze, whence it has been universally adopted throughout the United States. The university is also distinguished as a pioneer in adopting the principle of coeducation, being opened to women in 1870, and giving them equal privileges in all respects; this system has proved very successful from the first, and has never incurred any adverse criticism. The dormitory system adopted at first was discarded early in the history of the institution, but has in recent years been revived for women students. In addition to cottage dormitories, three commodious and magnificently appointed halls of residence for women, given by friends of the university, were opened in 1915. The 1,700 women students are all required to live in approved houses. Besides the halls and laboratories of the different departments the important buildings are the Alumni Memorial Hall, the Hill Memorial Auditorium, seating 5,100, the library, the museum, the observatory and the two gymnasiums. The university has a number of valuable collections in natural history, archæology, ethnology, materia medica, anatomy and the industrial and fine arts. Among these are the Chinese government exhibit at the New Orleans Exposition, presented to the university in 1885, and the Stearns collection of musical instruments. This is one of the most complete and significant collections of the kind in existence, containing about 1,500 examples of every type of musical instrument, and is supplemented by a very inclusive collection of books bearing upon the subject. The Frieze memorial organ, first built for the Chicago Exposition of 1893 and presented to the university by friends, was completely rebuilt and much enlarged when recently transferred to Hill Auditorium. The musical festivals, held annually in May at the university, are of international repute. The general library in 1919 numbered over 308,000 volumes, not including pamphlets; special libraries also belonging to the university are the science library (15,000 volumes), the chemical library (10,000 volumes), the engineering library (15,000 volumes), the medical library (30,000 volumes), the law library (40,000 volumes), the homœopathic library (4,000 volumes) and the dental library (3,100 volumes). A large and splendidly equipped building will be occupied in 1919. The main observatory, erected by the citizens of Detroit and known as the Detroit Observatory, contains a meridian circle constructed by Pistor and Martins of Berlin, a refracting telescope with an object-glass of 13 inches diameter and a recently constructed reflecting telescope of 37½ inches aperture and a refractor of 24 inches aperture. The observatory also contains a complete set of seismographs. Two hospitals are connected with the university, one under the direction of the Medical School, the other under the charge of the Homœopathic Medical School; with each of these is connected a training school for nurses. A course in public health nursing has also been introduced. The University-hospital will be rebuilt at an expense of more than $1,000,000 appropriated by the last two legislatures, and an appropriation of $300,000 for a school of education. The State Psychopathic Hospital is connected with the former. Ample provision is made for physical culture and athletics; besides the two well-equipped gymnasiums, one for men and one for women, there is an athletic field of 75 acres for men and a sports field of seven and one-quarter acres for women; the general supervision of athletic sports is vested in a board of control of 11 members, on which the faculty is represented by five members chosen from the university senate, the Alumni Association by three members and the students by three members chosen by the directors of the Students' Athletic Association. Important among student organizations is the University Oratorical Association, established by the students of the College of Literature, Science and the Arts to foster an interest in oratory and debate; this association is affiliated with various oratorical and debating leagues composed of representatives of universities of the North-Central States. The total income in 1918 was $2,378,556, including the regular State appropriation, together with an additional appropriation of $200,000 for the new library building; the fees to students are small, being somewhat less for residents of the State than for non-residents. The faculty numbers 610; the average annual attendance of students is over 7,000. During the World War, 1914–18, 3,000 students were enrolled with the colors. The total number of graduates to 1918 was 35,544. Tuition fees range from $45 to $130; living expenses $500.

MICHIGAN AGRICULTURAL COLLEGE, chartered in 1855, and opened in 1857, situated at Lansing. It was the first institution for agricultural education established in the United States. The Michigan State constitution provided that «The legislature shall as soon as practicable provide for the establishment of an agricultural school.» In 1850 the legislature petitioned Congress for a grant of land for an agricultural college within the State, but no attention was paid to this petition. In 1855, however, the legislature appropriated land and money for such a college and located it on a farm of 684 acres. From that time until 1862 the college was supported by State appropriations, and in that year received control of the Federal land grant. The courses offered in the college include full four-year courses in agriculture, engineering, home economics, forestry and veterinary medicine. Also short courses (varying from 8 to 16 weeks in length) in general agriculture, horticulture, poultry, creamery management and cheese-making. Graduate work is also provided for. The college holds each year, during the winter months, about 500 farmers' institutes throughout the State. The State Experimental Station is also connected with the college and receives a separate Federal appropriation annually. The extension work is carried on co-operatively with the United States Department of Agriculture under the terms of Act of Congress of 8 May 1914, known as the Smith-Lever Act. The farm consists of about 1,013 acres and the buildings are valued at about $900,000. The library contains about 40,000 volumes. The total annual income is approximately $1,730,000; the students number 2,000 and the faculty and assistants 224.

MICHIGAN CITY, Ind., city in Laporte County, on Lake Michigan and on the Chicago, Indianapolis and Louisville, the Père Marquette, the Lake Erie and Western and the Michigan Central railroads, about 40 miles east of Chicago. The place was visited frequently in the 18th century by missionaries, explorers and traders, but the first permanent settlement was made in 1832. The incorporation was made in 1833. It has excellent transportation facilities which contribute to its commercial and industrial growth. Its chief manufactures are hosiery, knit underwear, chairs, lumber, railroad cars, furniture, bicycles, surgical instruments and clothing. It has a large trade in iron ore, salt, lumber and farm products. It has the Northern Indiana State Prison, a United States life-saving station and on the lake front a park. Its educational institutions are a high school, public and parish schools and a public library. The city is governed under a charter of 1867, since amended, which provides for a mayor, elected biennially, and a common council. The administrative officials are elected by the council or appointed by the mayor subject to the approval of the council. The waterworks are owned and operated by the city. Pop. (1920) 19,457.

MICHIGAN COLLEGE OF MINES, at Houghton (q.v.), Mich., was founded in 1885 and opened in 1886. The school, a State-supported institution, is located in the midst of the mining region of the State, thus giving the students exceptional opportunities for observation and study. Practical work in mine surveying and mining is carried on for five weeks, 45 hours each week. The first two weeks are devoted to surveying and mapping a mine in the «copper country» or in the iron mining district; the last three weeks are given to the examination of mining methods and to making sketches of mines in the vicinity. The courses of study lead to the degrees of bachelor of science and engineer of mines. The college is well equipped with all necessary apparatus. There are nine college buildings with a library of 30,000 volumes. The metallurgical and assay laboratory is a brick building, and the ore-dressing building or stamp mill is a wooden building. A reverberatory roasting furnace stands near the mill. There are 24 instructors and an average yearly attendance of 280 students.

MICHIPICOTEN, mĭsh-ĕ-pē-kō'tĕn, a bay, island and river in the western part of the province of Ontario, in Canada. The bay is an arm of Lake Superior, on the northeast shore, about 100 miles north of Sault Sainte Marie. At the entrance to the bay is Michipicoten Island. The river has its source in lakes on the south side of the height of land dividing the waters of Hudson Bay and Lake Superior and falls into the bay 125 miles north of Sault Sainte Marie.

MICHLER'S KETONE, Tetramethyl-diaminobenzophenone, $(CH_3)_2N.C_6H_4COC_6H_4.N(CH_3)_2$, was first prepared in 1876 by W. Michler. He obtained the ketone by passing carbonyl chloride into cooled dimethyl aniline. The reaction mixture was then heated with water and the product was purified by treatment with hydrochloric acid and caustic soda. With slight modifications Michler's method is employed at the present time for the preparation of the compound. The ketone has also been prepared (1) by heating hexamethyl-triaminotriphenyl carbinol with hydrochloric acid, and (2) by heating a mixture of dimethyl-aminobenzanilide and dimethyl aniline in the presence of a small quantity of phosphorus oxychloride, and by decomposing the condensation product with an acid at slightly elevated temperatures. Michler's ketone forms bright grayish plates when crystallized from alcohol. It melts at 179° C. and boils with decomposition above 360° C. It has been used to a great extent in the manufacture of certain dyes. Thus heated with dimethyl aniline and phosphorus oxychloride it yields Crystal violet; with ammonium chloride in the presence of a dehydrating agent it forms Auramine; it condenses with phenyl-alphanaphthylamine into Victoria Blue B; with methyl-phenyl-alphanaphthylamine into Victoria Blue 4R, and with ethyl-alphanaphthylamine into Victoria Blue R. It also forms dyes with dioxynaphthalenes and with pyrogallic acid.

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MICHMASH, mĭk'măsh (modern Mukhmas), Palestine, seven miles northeast of Jerusalem. It occupies a highly important strategical position, commanding the north side of the Pass of Michmash on one of the two ancient caravan roads from Jerusalem to Mount Ephraim. Michmash lies on a plateau of rolling ground, but the road descends sharply into a rough valley at the bottom of which is the Pass of Michmash, a gorge with steep sides, which must be traversed by the caravans. It was here that the Philistines made their headquarters in their movements against the first uprising under Saul, and it was the scene of Jonathan's exploit related in 1 Samuel xiv. It was also Jonathan's headquarters in the time of the Hasmonæans (1 Macc. ix, 73). It was never a city, but was surrounded by wheatlands, and in the time of Eusebius it was a considerable village. The present village, Mukhmas, is small, and the road on which it stands is more or less abandoned in favor of the caravan road which keeps to the high ground and avoids the Pass of Michmash.

MICHOACAN, mē-chō-ä-kän', Mexico, a state, on the Pacific Ocean, bounded on the north by the states of Guanajuato and Jalisco, on the east by Mexico, on the south by Guerro and the Pacific and on the west by the Pacific, Colima and Jalisco. Area, 22,874 square miles. Three railroad lines cross parts of the state. The surface generally is mountainous; in the north and south are some flat lands. The volcano of Jorullo is in the southwest. The largest drainage streams are Las Balsas and Lerma on the boundary, and the Tepalcatepec. There are a number of lakes within the state limits, the largest of which is Cuitzeo. Except where the lands are low, the climate is healthful. The soil is fertile; the principal crops are sugar, tobacco, vanilla, wheat, rice and tropical fruits. Considerable attention is given to stock-raising. The minerals are valuable: The Don Estrellas mine is the largest producer of gold and silver in the country. The capital is Morelia (q.v.). Pop. of state about 1,003,491.

MICKIEWICZ, mĭts-kē-ĕv'ĭh, **Adam Bernard**, Polish poet: b. Novogródek, Lithuania, 24 Dec. 1798; d. Constantinople, 26 Nov. 1855. He was educated at the University of Wilna, where he became affiliated with several of the leaders against Russian control. His first volume of poems appeared in 1822 and stamped him the greatest poet of his country. Implication in political affairs caused his banishment to Russia in 1824, but in 1828 permission to leave Russia was granted him and he traveled in Germany and Italy, and in 1834 he went to Paris, where, in 1840, he became professor of Slavonic languages and literature in the Collège de France, where his radical teaching led to his suspension in 1844. In 1848 he attempted to enlist Polish regiments for service in the Italian struggle with Austria. He became librarian at the Arsenal in Paris in 1852. His remains were interred (1890) at Cracow. (See Pan Tadeusz). Among his works are ‘Conrad Wallenrod’ (1818); ‘Crimean Sonnets’ (1826); ‘The Books of the Polish People and of the Polish Pilgrimage’ (1832); ‘Pan Tadeusz’ (1834), etc. Consult L. de Loménie, ‘Galerie des Contemporaines,’ and Gardner, W. M., ‘Adam Mickiewicz, National Poet of Poland’ (1911).

MICKLE, mĭk'l, **William Julius**, Scottish poet: b. Langholm, Dumfriesshire, Scotland, 28 Sept. 1735; d. Forest Hill, near Oxford, 28 Oct. 1788. He removed to London in 1764, and in 1775 appeared his principal production, a translation of the ‘Lusiad’ of Camoens, with a historical and critical introduction, including a life of Camoens. His poetical works were published collectively, with memoir by Sim, in 1806. Among the best of Mickle's poems is the ballad of Cummor Hall, which has attained additional celebrity as having suggested to Sir Walter Scott the groundwork of his novel of ‘Kenilworth.’ The popular song, ‘There's nae Luck about the Hoose,’ has been claimed for him; other ascribe it to Jean Adams (1710–65), schoolmistress near Greenock.

MICMACS, mĭk'măks, a tribe of American Indians. See Algonquian.

MICROBE (Greek *μικρός*, little; *βίος*, life), a microscopic organism; applied particularly to bacteria, and more especially to the forms that cause disease. See Bacteria; Protozoa.

MICROCEPHALUS, *in pathology*, the condition of having an abnormally small head, further marked by a peculiarly shaped cranium. The forehead is small and receding and the vertex somewhat pointed. The various parts of the brain are unnaturally small. The condition results in mental deficiency, amounting in some cases to idiocy. Operative measures to restore or supply the ununited sutures and the spaces permitting the growth of the brain have been tried, but found unavailing.

MICROCLINE, a feldspar identical in composition with orthoclase, but crystallizing in the triclinic system. The name was given by A. Breithaupt in 1830, but the species was really first established by Des Cloizeaux in 1876. There is a green feldspar called Amazon stone which is really microcline, and much of the potash feldspar called orthoclase also is microcline. Thin sections examined in polarized light frequently show a grating-like structure, due to double twinning. The color varies from white to yellow and, occasionally, red or green.

MICROCONODON, a fossil animal of the Upper Trias in North America, doubtfully placed among the Protodonta, or most primitive of Mammalia, and of interest chiefly in reference to the structure of its teeth as indicating the subsequently developed mammalian type. Consult Osborn, ‘Evolution of Mammalian Molar Teeth’ (New York 1907).

MICROCOSM AND MACROCOSM. Among the ancients a belief prevailed that the world or cosmos was animated, or had a soul. This theory led to the notion that the parts and members of organic beings must have their counterparts in the members of the cosmos. The natural philosophers of the 16th century took up this theory in a somewhat modified shape, and considered the world as a human organism on the large scale, and man as a world, or cosmos, in miniature; hence they called man a microcosm (Greek, «little world») and the universe itself the macrocosm («great world»). Heylin gave the title ‘Microcosmus’ to a work on cosmography in 1621.

MICROCOSMIC SALT, used in blowpipe analysis; prepared by mixing concentrated solutions of phosphate of soda and chloride of ammonium. It has the composition $NaNH_4HPO_4$, 4 H_2O.

MICROFARAD. See Farad.

MICROLESTES. See PLAGIAULACIDÆ.

MICROLITE (Greek, «small»), a native pyrotantalata of calcium, containing fluorine and also nibium and various other bases. The formula has not yet been satisfactorily determined. Microlite crystallizes in octahedral forms belonging to the isometric system, and the crystals are often very small. It was first found at Chesterfield, Mass., where the crystals were so minute as to suggest the name «microlite.» Excellent crystals as much as an inch in diameter have since been found in Amelia County, Va., as well as imperfect ones weighing as much as four pounds. The mineral is usually yellow or brown in color, with a resinous lustre, a hardness of 5.5 and a specific gravity of from 5.5 to 6.1.

MICROMETER, an instrument for measuring minute angles and distances. The «double-image micrometer» is of importance in measuring the diameter of a celestial object; it is an eye-piece containing two halves of a lens, each half being movable by a micrometer screw (q.v.) in a direction parallel to the common diameter. When the halves form one lens the heads of the screws indicate zero. In making an observation of the diameter of a heavenly body the half-lenses are so moved that the image formed by one of them of one limb of the body coincides with the image of the opposite limb formed by the other half-lens; the readings of the screw-heads determine the apparent diameter of the body.

MICRON, mī'kron (Greek, «very small»), a unit of length equal to the millionth part of a metre, or the 25,400th part of an inch. It is much used among physicists in connection with precise measurements, and has been officially sanctioned by the International Commission of Weights and Measures. The Greek letter μ is used as its symbol. Thus «47 μ » is read «47 microns.» The names «bicron» and «tricron» have been proposed, respectively, for the billionth and trillionth part of a metre, but they have not been generally adopted, and probably will not be. Etymologically, at least, they are monstrosities.

MICRONESIA. To the islands shortly north of the equator in the Pacific has been applied the designation «Micronesia» (Greek, *mikros,* small; *nēsos,* island). The designation aptly describes the physical appearance of the islands of this subdivision of Oceanica, for they are generally small and generally low, and the section contains a larger proportion of islands of the atoll type than any other subdivision of the globe. Listing the several archipelagoes from the east toward the west we find the Marshall group, with its two chains, the Ratak and Ralik; the Caroline group; the Palau, and the Marianas or Ladrones. In the order of their discovery all of these islands, with the exception of the Marshall group, came under the sovereignty of Spain in the 15th century, and with a single exception remained Spanish until the year after the Spanish War, in which they passed to the German Empire, by purchase, for 24,000,000 pesetas; they remained German until their capture by the naval forces of Japan in October 1914. The single exception to the German purchase from Spain is the island of Guam, which was captured by the United States in the Spanish War in 1898, and now remains an important base of American naval strategy in the Pacific. This is the southernmost island of the Ladrones, possesses a good harbor and is 47 miles distant from the island of Rota, its nearest neighbor. Despite the infrequency of rain all of these islands may be regarded as fertile and abundantly productive. The staple product of such agriculture as is practised by the inhabitants is the cocoanut, whose dried meat, known commercially as copra, finds extensive use in the production of oil and feed-cake. In climate, conditions are found such as might be expected in low altitudes in immediate proximity to the equator, but the excessive temperature is very pleasantly moderated by the prevalence of ocean breezes. Lying in the region between the two trade winds precipitation is generally below the normal, and the supply of water is markedly deficient, in some islands the only potable water being that which is obtained by filtration through the beach sand into temporary wells which are dug above high water mark. The islands in general lie outside the hurricane belt, yet at rare intervals they have been visited by destructive gales of this type. The ethnological position of the islanders is as yet imperfectly known; physically and in language they differ from the other inhabitants of the Pacific, and in some particulars they seem to suggest a certain degree of derivation from the races of the southeastern corner of Asia, between Tibet and Cambodia. Within a historic period, the native race of Guam, the Chamoro, have been destroyed in a futile insurrection against the introduction of foreign culture.

In 1850 the greater part of Micronesia came under the influence of American missionaries, who in that year established a station on the island of Kusaie, in 1856 extended their work to the Marshall Islands, and later spread their efforts over all of the eastern Caroline Islands; in this latter field they came into conflict with the Spanish government, and were forced to withdraw. Micronesia, since the discovery period, has been but scantily subjected to scientific investigation, except upon the linguistic side. Consult Christian, F. W., ‹The Caroline Islands› (London 1899); Furness, ‹The Island of Stone Money› (Philadelphia 1910); Father Salesius, ‹Die Karolinen-Insel Jap› (Stuttgart 1904); Bartolis, ‹Las Carolinas› (Barcelona 1885); Cabeza Pereira, ‹Estudios sobre las Carolinas› (Manila 1895).

MICRO-ORGANISM. See BACTERIA.

MICROPHONE. See ELECTRICAL TERMS.

MICROPHOTOGRAPHY, the art of photographing minute objects by combining a camera with a microscope in such a way as to obtain a picture of the object as enlarged by the lenses of the latter instrument; also, the art of making a photograph on a minute scale, by means of reducing lenses, of any object, as a page of print, which may afterward be enlarged by rephotographing it through a microscope. Also called *Photomicrography.* See PHOTOGRAPHY.

MICROPYLE, the minute opening in the integument of an animal egg-cell, or in the ovule of a plant, by which the spermatozoon in the case of an animal, or the pollen of the plant, enters the egg or ovule to make contact with the germinating vesicle and effect fertilization.

MICROSAURI, an order of Prosauria. See HERPETOLOGY.

MICROSCOPE, an optical instrument by which images of objects are so magnified that details invisible or indistinct to the naked eye are clearly observed. In the ordinary microscope the magnifying power is interposed directly between the eye and the object, in the manner of a magnifying glass; and although the power may consist of several lenses, they combine as one. See LENS.

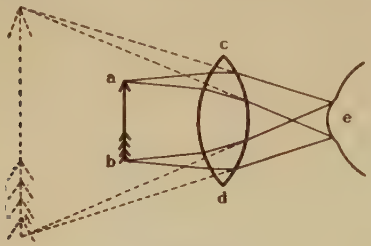


FIG. 1.

Microscopes are of two types — simple and compound, the former being used for low magnifications, rarely exceeding 20 diameters, whereas the latter may give as high as 4,000 diameters magnification. In the simple form the eye views the object directly (Fig. 1), whereas in the compound form an enlarged image is formed by one lens, which image is magnified by another lens or pair of lenses, at the same time reversing it so that what is at the right hand in the object is at the left hand in the image. (Fig. 2.) A short focus positive lens becomes a simple microscope when used for directly viewing an object; its usual form is that of the Pocket Magnifier, and although generally consisting of a combination of two or more lenses with the view of improving its quality, it always remains optically simple. The most simple forms are one or several convex lenses mounted separately and offering a variety of foci, and hence of magnifying power. These lenses have two defects, one, chromatic aberration, which fringes the images with the colors of the spectrum, most noticeably red or yellow, and blue; the other, spherical aberration, which is most noticeable by the lack of distinctness increasing toward the edge of the field. Improved forms are constructed to overcome these defects. The most simple of these is the Coddington lens, originally a section of a sphere, but, as generally made, a thick double convex lens with a circular groove which acts as a diaphragm. The achromatic lens when composed of three lenses, two concavo-convex flint glass lenses enclosing and cemented to a double convex crown glass lens, is the best form. These are usually placed in a folding mounting for pocket use. The simple microscope is also made in more complex form for dissecting purposes, a mechanical construction, more or less elaborate, being added, which provides adjustment for the lens in relation to the object, a platform or stage for the latter, and a mirror for reflecting light to illuminate the object. (Fig. 3).

In the compound microscope the lens which gives the first magnified image is the one nearest the object, and therefore called object-glass or objective. The optical part which magnifies the image formed by the objective is the one to which the eye is applied and is called the eye-piece or ocular. This latter, in its common form, is called a Huyghenian, eye-piece, after Huyghens, who used it in the earliest and most primitive telescope construction. It consists of two plano-convex lenses (Fig. 2), suitably mounted in brass, the lower lens, *il*, being called the field lens, the upper one, *op*, the eye lens. It is a negative eye-piece, as its focus lies within itself, a diaphragm *cd* which limits the field of vision being placed at this point. The action of the compound microscope is plainly shown in Fig. 2. The image of the object *ab* is carried through the objective *gh* to the field lens *il* of the eye-piece, and thence

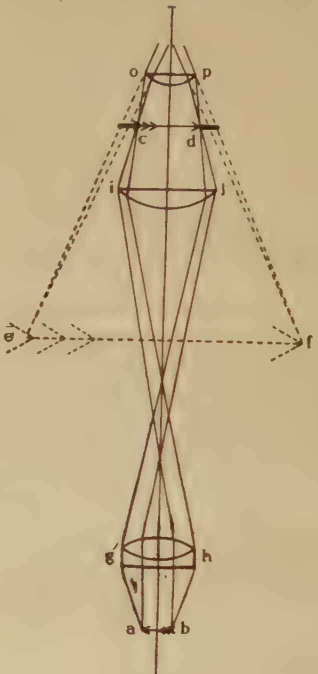


FIG. 2.

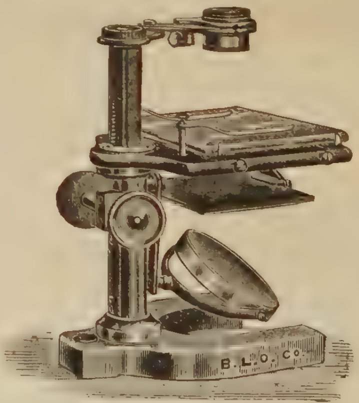


FIG. 3.—Dissecting Microscope.

to a focus at the diaphragm *cd*. At this point it is viewed by the eye lens of the eye-piece and magnified to the size *ef*. Fig. 4 shows the appearance of the working instrument in which the principles exhibited in the diagram, Fig. 2, are applied. The particular instrument shown is fitted with three objectives of different focus set on a pivot, so that any one of them may be brought into the axis of the tube. There is a rack and pinion for adjusting the focus and micrometric attachments for moving the object on the stage. The tube and stage are pivoted on the two pillars to incline at any convenient angle. The magnification of the compound microscope depends upon three conditions: (1) The power of the object-glass, (2) the power of the eye-piece, (3) the amount of separation of these two optical parts. If the focus of the object-glass is reduced, the power is increased, and the same holds true with the eye-piece. The more the objective and eye-piece are separated, the greater will be the power. It will appear from this statement, therefore, that the magnification of the microscope is unlimited, but the mere magnification of an object is less sought after and is of less value in the modern microscope than its definition or power to disclose detail and structure. The length of tube which connects the eye-piece and objective is limited to from six to eight inches, for the sake of convenience in use. A draw-tube permits the length to be extended to 12 or 13 inches for the highest powers. The standard length of the microscope tube must be closely adhered to or else the optical capacity (correction) of the objective will be disturbed. The power of the eye-piece rarely exceeds 15 diameters and that of the objective 150 diameters. A convex lens of one inch focus gives a magnification of about 10 diameters at a distance of 10 inches, and this holds true of a combination of lenses of this equivalent focus as in the eye-piece. If therefore a one-inch focus eye-piece is 10 inches distant from a one-inch objective, the magnifying power is $10 \times 10 = 100$ diameters; or, if 5 inches distant, is one-half as great, or 50 diameters. The designation of power is according to the focus of a single lens having the same magnifying power as the series or combination of lenses which make up the objective as well as eye-piece. As the image of the objective is magnified by the eye-piece, it is evident that any defect in the objective is magnified to the same extent, and unless eliminated would seriously interfere with obtaining a distinct image. The main problem, therefore, remains to convey through the objective as many image-giving rays, free from defects, as possible. As a matter of fact, objectives, whatever their power, are composed of a series of lenses whose purpose it is to correct errors which would exist if single lenses alone were used, and the greater the power of the objective, the larger the number of lenses required. In the low powers there are generally two systems of lenses, each of which is an achromatic doublet; in the medium powers the principal magnification is obtained by a single front or hemispherical lens and two systems of cemented and corrected lenses; in the high powers it is usual to employ two superposed hemispherical lenses, adding thereto two corrected combinations. As may be supposed, the production of these lenses and setting them in mountings involves the most accurate processes. First of all the various kinds of glass must have fixed and previously calculated properties and be of absolute homogeneity and freedom from blemishes. The production of such glass is in itself a laborious and delicate process. The lenses must be accurately ground and polished to absolutely correct spherical surfaces, truly centred and cemented, then set in suitable mountings without strain at absolutely correct distance and the axes of all in alignment. The efficiency of an objective to gather up rays emanating from an object and form a perfect image depends upon its angular aperture — in other words, upon the angle at a point in the axis of the microscope subtended by the diameter of the object in its normal horizontal plane; and this really determines

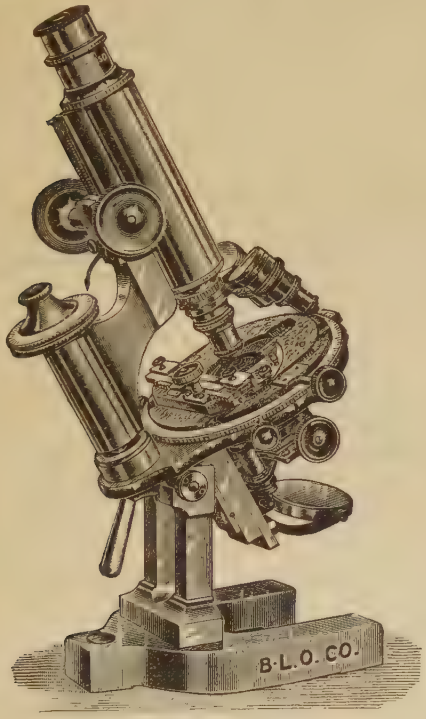


Fig. 4.—Compound Microscope.

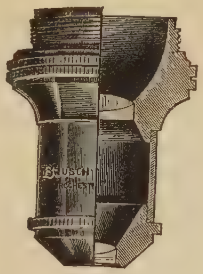


Fig. 5.—A low power (⅔″) microscope objective of two systems.

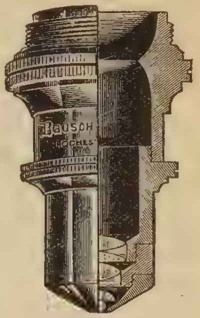


Fig. 6.—A high power (1-12″) microscope objective of four systems.

the visibility of detail (correction for chromatic and spherical aberration being presupposed). On account of the loss of light and inability to obtain sufficient angular aperture in the ordinary way in the very high powers, it is necessary to construct them for immersion contact with the object, and they are then termed «immersion objectives.» The immersion medium commonly used is a drop of cedar oil, which has the same refractive index as glass. The connection of the objective with the object by the globule of oil prevents the light rays from scattering. The highest power in general use is the 1/12-inch focus, giving a magnification up to 3,000 diameters, the medium powers are ⅙ to ⅛ inch, and the low powers from 1 to ⅔ inch.

Having reached the practical limits in the reduction of the focal length of microscope objectives the lens makers turned to the problem of increasing the «numerical aperture» — that is, an arbitrary numeral representing the product of one-half of the angular aperture of the objective by the refractive index of the medium between the cover glass of the slide and the outer lens of the objective. A high degree of success has been attained, so that dry lenses of 0.9, water immersion lenses of 1.2 and oil immersion lenses of 1.4 are available (against theoretical calculations respectively of 1.0, 1.4 and 1.53).

To properly adjust the optical parts which have a fixed relation to one another by means of a tube (body) and to hold the object in its proper position in relation to them involves certain mechanical appliances which provide stability, convenience of adjustment and illumination: a rack and pinion provides coarse adjustment and a micrometer screw fine adjustment; both are extremely delicate; the stage or platform for placing the object, and mirror beneath the stage for reflecting abundant light and a base for stability. This aggregate of mechanical parts is called the «stand.» The collar at the end of the tube to which the object glass is applied is the nose-piece; double and triple nose-pieces are also made to take two and three objectives, which may be rotated and focused on the object in turn. A mechanical stage provides delicate means of adjusting the object in place of the hands. The high powers require more than the usual amount of light for illumination and a condenser gathers it from the mirror and concentrates it upon the object. Micrometers are provided to determine the amount of magnification and measure the actual size of an object. A camera lucida attachment is made to project the magnified image upon a sheet of paper on the table to facilitate its drawing. Beside the microscope with single tube, there is another in which the rays from the objective are bisected and diverted into a second tube, so that the object may be viewed with both eyes. This is the binocular microscope. A special form of microscope known as the «micro-metallograph» is used for the examination of cold metals. The stage is above, with the objective below it and looking upward. The eye-piece is at the end of a horizontal tube, the light rays being carried into it by means of a prism. Another prism on a lower plane is used to illuminate the lower side of the object. The so-called «thermal microscope» is so modified from the usual model as to have a water-jacket around the objective to keep it cool while examinations are being made of heated objects in the small electric furnace provided as an accessory with the metallurgist's microscope. So far as our knowledge of the action of light and the constitution of visual images goes, the best microscopes now made realize about the limit to which the seeing powers of the instrument can be brought, although experiments with especially controlled illumination, now in progress, may result in advancement in this direction. Nevertheless the field of research and discovery into which the microscope has as yet not penetrated, and which are within its powers, are almost unlimited.

The microscope is used as a necessary accessory in a large number of the sciences and in many industries. It is, primarily, the assistant of the teacher of biology, botany, bacteriology, histology, pathology and the allied branches of science. The medical profession employs it in the examination of the urine, blood and of cancerous and tumorous growths, as well as in searching for the parasites of the body, fungi which infest the hair and skin and for diagnosing febrile diseases. For the examination of steel, iron and other metals to determine their intimate structure, the microscope is extensively used. Its use for the detection of adulterations in foods, drugs, paints, earths, starches and many other substances is often the only effective method of working. The Bureau of Animal Industry of the United States government depends wholly on the microscope for the detection of living parasites in the flesh of animals slaughtered for food. The microscope is used in many industries for counting fine lines, threads and fibres, and for determining the physical structure of cements, emulsions and other substances. The finest possible measurements of space are made with the microscope to which a filar micrometer is applied, and with it the rate of growth in plants is determined.

The use of the microscope for photography also embraces an extremely wide and useful field. Photographs of minute objects enlarged as much as 5,000 diameters (25,000,000 areas) can be produced in this manner, and a permanent record made which can also be used for reproduction by the usual printing processes for the illustration of books, etc. Recently the movements of insects and other small creatures have been reproduced by a biographic microscope, and moving pictures of the unseen world are now presented to audiences as a means of amusement and education.

The microscope was invented between 1590 and 1609 — the honors being divided between Hans and Zacharias Janssen, two Hollanders, and that greatest of early opticians, Galileo. From its early form, consisting simply of a double or plano-convex object lens with an eye-piece of a single convex lens to magnify the image, it developed by gradual stages until the latter part of the 18th century, without becoming much more than a toy for the amusement of dilettante. As a matter of fact nearly every form of accessory which is in use at the present time was devised and used in some form, but the desire for the ornamental and extraordinary rather than the practical was everywhere manifest. With the awakening of general interest in scientific investigation, the microscope began to be used as a tool to accomplish heretofore impossible results. This led to more practical forms of construction, and at last to their production in large quantities and at a cost which placed them within the reach of laboratories and individuals. In 1820 Fraunhofer invented a complete system of computation for telescope lenses, and Seidel and Steinheil soon followed with formulas for photographic lenses. In 1840 the Gauss theory was introduced and workers in optics applied this theory to computing lenses for the microscope. In the early 70's Professor Abbe of the Zeiss optical works at Jena produced computations for microscope lenses which placed them in the front rank of scientific appliances. Among the early American pioneers in the optical improvement of the microscope, the names of Robert Tolles and the two Spencers stand prominent. By their extraordinary manual skill and knowledge of optical principles, they succeeded in producing lenses which, in the case of one by Tolles, had a focal length of 1/75 inch, the highest power objective which has ever been constructed. It was found in practice, however, that, through inability to increase the angle of aperture, these lenses gave no advantage over those of longer focus, and it is now rare to find an objective of less than 1/16 inch focus. With the introduction of the new optical glasses by the Jena works in 1886–92, new corrections were possible with microscopic systems, and the phosphoric acid and boric acid glasses were especially useful to the microscope makers. But the greatest advance was made by the discovery of fluorite as a lens material, permitting the flat curvatures necessary in the correction of spherical aberration. The resolving power of microscope lenses was greatly increased and the problems of their manufacture materially simplified by the invention by Tolles of his «duplex front» objective, a construction which was voted impractical by the experts of the time, but which has since superseded all others in the construction of high-power lenses. By the application of Tolles' correction formulas to the Jena glass lenses a new series of very superior microscopic systems was produced in 1911 by Winkel of Göttingen, notable particularly for brightness and sharpness of the image. See MICROSCOPY, CLINICAL; ULTRAMICROSCOPE.

Bibliography.— Carpenter, W. B., 'The Microscope and Its Revelations' (Philadelphia 1901); Gage, S. H., 'The Microscope' (Ithaca, N. Y., 1911); Hovestadt, H., 'Jena Glass and Its Scientific and Industrial Applications' (London 1902); Spitta, E. J., 'Microscopy: The Construction, Theory and Use of the Microscope' (New York 1907); Zeiss, K., 'Microscopes and Microscopical Accessories' (Jena, Germany, 1906).

MICROSCOPE, Solar, a form of microscope in which the illumination is gained from the condensed rays of direct sunlight. It is used for projection purposes where a very powerful light is needed to exhibit the microscopic images upon a screen.

MICROSCOPIUM, *in astronomy,* one of the 14 constellations which Lacaille added to the heavens in connection with his work at the Cape of Good Hope. It is a very inconspicuous constellation, its brightest star being of only 5.1 magnitude.

MICROSCOPY, Clinical, the use of the microscope in the diagnosis of disease. The microscope, ever since its first construction, has been used in the study of disease processes, but only within comparatively recent years has it attained its present importance as an adjunct in the clinical diagnosis of many different types of disease. Owing to the development of knowledge of parasitic and infectious diseases, the physician of to-day is better able to make an accurate diagnosis by means of the microscope than were his forefathers. The microscope may be used not only to confirm a diagnosis which has been made by ordinary clinical methods, but it may abbreviate such clinical examination, or by it a diagnosis may be made without such preliminary examination. Thus at the present time consumption of the lungs may be microscopically diagnosed by an examination of the sputum, though the patient be 1,000 miles away, and in the same manner a number of diseases of allied forms may be recognized by certain minute evidences interpretable by the microscope.

The most important of the intestinal parasites that can be thus identified are the tapeworm, roundworm, hook-worm, fluke-worm and pin-worm. In all of these the physician of the present time, by a microscopical examination of the fæces, can detect the presence of the eggs of the different kinds of worms and make a definite diagnosis. It is not necessary for parents to guess at the presence of worms and to treat their children «on suspicion.» The presence or absence of worms can be accurately and definitely determined by a competent microscopist. Not only can a diagnosis of worms in general be made, but the precise kind of worm can be known by the characteristic configuration of the eggs. Examination of the fæces by the microscope can further detect various forms of indigestion and various kinds of inflammation in the intestinal tract.

As already indicated, tuberculosis can be told by an examination of the sputum, and the bacillus of tuberculosis can also be identified if it invades other organs of the body, notably the skin, bladder, kidneys, etc. The presence of tuberculosis in milk can also be demonstrated by the microscope. The influenza bacillus, the bacillus of diphtheria, the organism of cholera, of dysentery, of malignant pustule, of blood-poisoning, of pneumonia, of actinomycosis, etc., can all be identified by a microscopical examination, as also can a number of diseases due to animal parasites in the body, other than intestinal worms. Thus there is no excuse for the general diagnosis of malaria unless the exact confirmatory evidence of the malarial parasite is found in the blood. The presence of *Trichina* in the body can also be learned by the peculiar changes that take place in the blood, and the blood-parasite *Filaria* (see FILARIASIS), which causes a variety of conditions in the tropics, is recognizable under the microscope. Further, the microscopical examination of the blood itself offers a large field for clinical microscopy; a field which is very rapidly widening and offering increasing evidence of the value of this class of examination. There are many blood-diseases, *per se*, which can be diagnosed by simple examination. Anæmia and pernicious anæmia are important examples. Moreover, most of the acute infectious diseases cause certain changes in the blood which may be utilized in microscopical work for diagnostic purposes. The Widal agglutination reaction in typhoid fever is an important development in this line. Other agglutinating reactions are of immense importance in medico-legal work. These blood-changes are of a very definite character and have been studied by physicians the world over. Because of their peculiar technical nature they lend themselves to charlatan misinterpretation and serve as a basis for many quackish advertisers.

Microscopical examination of the urine has long been practised. By it various forms of disorder of the bladder and of the kidney can be told, and both renal disease and bladder-disease can be detected long before such troubles become chronic and dangerous. In much the same manner the microscope can be used to examine other secretions and excretions of the human body — the secretions from the nose, the vomit, the exudates in pleurisy, exudates in meningitis and peritonitis, etc.— and in the study of drinking-water, milk and food-stuffs. In fact there is no branch of medicine in which definite and far-reaching results have not been obtained by means of the microscope. Consult von Jaksch, ‘Clinical Diagnosis’; Simon, ‘Clinical Diagnosis’; Ewing, ‘Pathology of the Blood’; and Cabot, ‘The Blood.’

MICROSOME, one of the minute corpuscles that exist in great number in the interior layers of the protoplasm within a cell, giving to that protoplasm its characteristic granular appearance. See PROTOPLASM.

MICROSPORANGIUM, *in botany,* the pollen-sac which produces the tiny microspores in quantity, as distinguished from the megasporangium, the pollen-sac which produces but one large spore or megaspore. Both kinds of pollen-sacs are found in certain members of the Pteridophyta and the Phanerogams. In the former group are the aquatic cryptogams belonging to the families *Marsileaceæ,* or pepperworts, and *Salviniaceæ,* known as «floating moss,» and the *Selaginellaceæ,* closely akin to the «club mosses.»

MICROTASIMETER, an instrument invented by Thomas A. Edison in 1878. He uses the principle of the carbon microphone to measure infinitesimal pressure, or for detecting very slight pressure.

MICROTOME. The microtome is an instrument used by botanists and zoologists for cutting thin sections of plant or animal tissues. A sharp and highly tempered knife is held in a rigid clamp, while the object to be sectioned, also firmly held in a clamp, is moved up, a little at a time, as successive sections are cut. To one unacquainted with modern microscopical technic, the results obtained with the latest microtomes seem almost miraculous. The pollen grain of a lily is so small that it is barely visible to the naked eye, but it can be cut into 50 sections, which can be mounted in order without the loss of a single section. A photomicrograph of such a section can be made, and lantern slide made from the photomicrograph, and the section of the pollen grain may be projected so as to cover a 15-foot screen, its thousands of starch grains appearing as large as walnuts and its two nuclei as large as footballs. Sections as thin as 25,000 to the inch have been cut successfully. Such thin sections, however, are hardly necessary in practical work. Most sections are cut at about 10 times that thickness, or 2,500 to the inch. Before such thin sections can be cut, material must undergo a rather complicated treatment. A root tip, for instance, may be treated as follows: It is killed and somewhat hardened in chromic acid; the acid is washed out in water; the root tips are then placed in weak alcohol, then in stronger and stronger alcohol, several hours in each solution; then in absolute alcohol which not only completes the hardening but removes the last traces of water; then some oil, like xylol, is mixed with the absolute alcohol in successively stronger solutions until pure xylol is reached; paraffin is then added gradually for several days; the material is then placed in a paraffin oven and thoroughly infiltrated with paraffin, after which it is poured out and cooled, so that the root tips are now embedded in a matrix of paraffin. A rectangular block containing a root tip is now fastened in the microtome and sections are cut. As each successive section is cut, it sticks to the preceding section, so that a ribbon, often several feet in length, may be obtained. Thus the sections are in perfect series. The sections are then mounted on glass slides, the paraffin is dissolved away, various stains are applied and finally a drop of balsam and a thin glass cover complete the preparation, and it is ready for use. Investigations upon the structure of tissues and cells are dependent upon the microtome and microscope and histological technic. Consult Chamberlain, C. J., ‘Methods in Plant Histology’; Guyer, M. F., ‘Animal Micrology.’

CHARLES J. CHAMBERLAIN.

MID-EUROPEAN UNION, an organization formed in the United States in 1918 under the presidency of Prof. T. G. Masaryk, leader of the Czecho-Slovak Committee. An offspring of the European War, the Union was composed of the nationals, descendants, emigrants from and sympathizers with the «subject races» of central Europe, with the object of promoting the liberation and independence of those countries from the political ties which bound them to Austria, Germany and Russia. The nationals or states claiming self-determination were from Russia, Poland, Finland, Ukraine, Lithuania, Livonia, Courland and Esthonia; from Germany, the Polish region of East Prussia (Posen); from Austria-Hungary, Austrian Poland, Galicia, Czecho-Slovakia (including Bohemia), Jugoslavia (including Serbia, Montenegro, Albania, Croatia and Slavonia) and the Rumanians of Transylvania; Italian and Greek «irredentists,» Albanians and Zionists. All these are dealt with elsewhere under their respective headings. The total of the populations involved was given as 65,000,000. On 26 Oct. 1918 the Union issued a «declaration of independence» at Independence Hall, Philadelphia, pledging the people they represented and all their resources to the support of the Allies «against our common enemy.» The declaration condemned secret diplomacy and approved the formation of a league of nations. It was the defection of the Slav nationalities in Austria-Hungary that was mainly responsible for the collapse of the Dual Monarchy in the war.

MIDAS, mī'dąs, in Greek myth, a king of Phrygia, proverbial for his golden touch and for his ass's ears. The gift of the golden touch came from Bacchus, whose follower, Silenus, Midas rescued and treated kindly; in return Bacchus offered him any wish he would name and Midas asked that all that he touched should be turned into gold. When he found that food and drink became gold at the touch of his lips, Midas besought Bacchus to take back the gift; some stories say he was sent to bathe in the river Pactolus, which ever after was full of gold-bearing sand. His ass's ears were given Midas by Apollo to punish the king for declaring Pan's pipe more musical than Apollo's lyre. Hence «ears of Midas» is a phrase used of ignorant critics. Midas' barber discovered the king's secret deformity; and whispered it into a hole in the ground, when reeds grew up whispering the story in the wind.

MIDAS, a genus of marmosets, of the family *Mididæ*. The name is given to more than 20 species, among which are the lion-marmoset, marikina, pinche and tamarin. The name is most commonly applied to the marikina.

MIDAS MONKEY, a marmoset (q.v.).

MIDDELBURG, mĭd'dĕl-boorg, Netherlands, capital of the province of Zealand, on the island of Walcheren, 4½ miles northeast of Flushing. Middelburg was a mediæval Hanse town, and one of the leading mercantile cities of the United Provinces, sending many ships to the East and West Indies, and the Levant. Its former commercial importance, however, has declined, being now confined chiefly to a coasting and domestic trade.

MIDDLE AGES, Democracy in. See DEMOCRACY, HISTORY OF.

MIDDLE AGES, The, a period of history supposed to extend from the fall of the Roman Empire to about the year 1550, covering from 10 to 11 centuries. The Middle Ages embrace that period of history in which the feudal system was established and developed, down to the most prominent events which necessarily led to its overthrow, though its consequences and influences are still very observable in the states of Europe. The first centuries of the Middle Ages are often termed the Dark Ages (q.v.). Still, the destruction of Roman institutions by the irruption of barbarous tribes is often unduly lamented, and the beneficial consequences attending it overlooked. True it is that many of the acquisitions which had cost mankind ages of toil and labor were lost in the general wreck, and only regained by the efforts of many successive generations; the flowers of civilization were trampled underfoot by barbarous warriors; the civil development of society suffered a most severe shock; those nations to which Roman civilization had extended previous to the great invasion of the Teutonic tribes were thrown back in a great measure to their primæval barbarism, and the unruly passion for individual independence greatly retarded the development of public and private law, and in some countries has entirely prevented a regular civil constitution. So also the most remarkable institution of that time, its characteristic production — chivalry — exhibited all the peculiarities of the corporations. War was the profession of the nobles. No one of their order who was not a knight could bear a lance or command cavalry. The weak side of the Middle Ages is the scientific. Physical science was still in a very crude state, and the lack of the proper apparatus necessary for its accurate pursuit was a serious handicap. Considering, however, the inefficient means then at hand, the knowledge attained, though of course rude, inaccurate and often mere guessing, was greater than is popularly supposed. The efforts of Charlemagne in the 8th century to encourage science and instruct the people laid the foundations for a more thorough and systematic training, which culminated in the great schools of Scholasticism of the 12th and 13th centuries. The process was slow and often retarded by the unsettled social and political conditions that prevailed through this period. The 14th and 15th centuries witnessed a rapid and brilliant development finding its apogee in the Renaissance movement. See HISTORY, MEDIAEVAL.

MIDDLE C, *in music,* the note C', on the first ledger line above the base or below the treble staff. It is the usual starting point of both keyes, tones and notes, and is also known as Alto C. The pitch is from 250 to 265 vibrations a second. It was set at about 240 in 1700 and has been as high as 275. The French set it at 251, the English at 256 and the Germans at 264.

MIDDLE EAR, Inflammation of. See OTITIS MEDIA.

MIDDLE ENGLISH. See ENGLISH LITERATURE.

MIDDLE EUROPE, in German, **MITTEL-EUROPA,** is the name applied to one of the alleged policies that were to be pursued by Germany in the process of carrying out the Pan-German program of «World Empire or Downfall.» Briefly stated, the scheme consisted of absorbing a number of European states into a German confederation either by treaty agreements or conquest. Thus, Norway and Sweden were to be absorbed; Holland with her colonial possessions was to become an ally of Germany; in order to establish Germany's position as a naval power, naval stations would be necessary at Dover and Malta; the western portion of Russia down to the Black Sea was to be conquered; according to Bernhardi, Denmark was «of great military importance to us»; the command of the Straits leading to the Baltic would be imperative for operations against England; according to some exponents, Holland, Belgium, Luxemburg and Switzerland were to be annexed and all foreign influence eliminated; while Livonia, Trieste, Venice and the north of France from the Somme to the Loire were to be included. Germany, Austria-Hungary and Italy were to be firmly united by an economic union. The items represent the Mittel-Europa plan, beyond which lay other necessary acquisitions, such as Egypt, central Africa, Asia Minor, India and sundry South

American republics. See Pan-Germanism. Consult Naumann, ‘Central Europe’ (New York 1916).

MIDDLE KINGDOM (Chinese, Chung Kwoh), or the **MIDDLE FLOWERY KINGDOM,** a native name for China dating from the establishment of the Chau dynasty, about 1150 B.C., and originally applied to the special state of the imperial family, which was in Honan and was surrounded by the others. As the empire grew the name was retained and applied to the entire country and popular belief interprets it as meaning that the empire is the centre of the earth.

MIDDLE TEMPLE. See Temple, London; Inns of Court.

MIDDLE TOWN INDIANS. See Miwok Stock.

MIDDLEBORO, mĭd'l-bŭr-ō, Mass., town in Plymouth County, on the Nemasket River, and on branches of the New York, New Haven and Hartford Railroad, about 30 miles south of Boston and 18 miles northeast of Fall River. It is one of the oldest towns in the county, having been incorporated 1 June 1669. It includes the villages of Nemasket, North Middleboro, South Middleboro, Four Corners, Puddingshire, Waterville, Tack Factory, Eddyville, Rock, the Green and Thomastown. It has excellent water power, obtained from three falls. The chief manufactures are woolen goods, shoes, stove polish, lumber, dressed marble, grates, foundry and machine-shop products. It has several well-built churches, good schools and a public library. It is a favorite summer resort, on account of its attractive scenery and the temperature being modified by the sea breezes. Pop. 8,300. Consult Barber, ‘Historical Collections of Massachusetts.’

MIDDLEBURG, mĭd'l-berg, **Aldie and Upperville, Cavalry Engagements at.** On 16 June 1863 General Stuart, with three brigades of his cavalry division, moved north from the Rappahannock to screen the movement of the Confederate army toward the Potomac. Stuart's orders were to keep along the eastern base of the Blue Ridge, occupy the passes of Bull Run Mountain, and cover the front of Longstreet's corps. On the 17th Fitzhugh Lee's brigade, under Colonel Munford, was sent from Piedmont, by way of Middleburg, to Aldie, to hold the gap in the mountain as a screen to Longstreet's movements, while W. H. F. Lee's brigade reconnoitred toward Thoroughfare Gap. Robertson's brigade was posted at Rectortown. Stuart, with his staff and a few pickets, made his headquarters at Middleburg. General Pleasonton was near Manassas Junction and scouting in the direction of Bull Run Mountain, and at 2.30 P.M. of the 17th Kilpatrick's brigade of cavalry ran into Munford's pickets, driving them back to Aldie, where, west of the village, he found Munford strongly posted on a hill covering the road to Snicker's Gap. A severe engagement ensued, lasting until dark, when Munford withdrew toward Middleburg, under orders from Stuart, who had been attacked. The Union loss was 50 killed, 131 wounded and 124 missing. Munford's loss was 119 killed, wounded and missing. While Kilpatrick was engaged at Aldie Colonel Duffié, with the First Rhode Island Cavalry 300 strong, having passed through Hopewell Gap, reached Middleburg about 4 P.M., drove in Stuart's pickets, and occupied the town, Stuart narrowly escaping to Rector's Cross Roads, and sending orders for Munford to withdraw from Aldie, the other two brigades to move upon Middleburg, and all to concentrate against Duffié. Robertson's brigade arrived at 7 P.M. and attacked Duffié, who made a good fight behind stone walls and barricades, repelling several assaults, but was finally driven from town, with severe loss, and compelled to retreat by the road upon which he had come until he had crossed Little River, where he halted, and where during the night he was entirely surrounded by W. H. F. Lee's brigade. Duffié endeavored to cut his way out, but was met by heavy fire, and a great part of his command captured, Duffié escaping with a few men and making his way back to Hopewell Gap and Centreville. His total loss, killed, wounded and prisoners, was over 200. On the 18th Stuart took position outside of Middleburg with Robertson's brigade. Munford was on the left at Union and Jones' brigade was ordered up as a reserve. Pleasonton moved forward with all his available force, and occupied Middleburg and Philemont on the road to Snicker's Gap. On the 19th Gregg, with two brigades of his own division and one of Buford's, advanced and steadily drove Stuart in the direction of Upperville, losing 99 in killed, wounded and missing. During the day Hooker advanced and occupied Aldie Gap with infantry. On the 20th Stuart concentrated his five brigades about three miles west of Middleburg, Pleasonton remaining at Middleburg. On the morning of the 21st Pleasonton moved out of Middleburg, Buford's division by the road through Union, to turn Stuart's left, Gregg's division, supported by Vincent's infantry brigade on the main road to Upperville. Buford encountered W. H. F. Lee's and Jones' brigades and drove them back, and Gregg met Hampton's and Robertson's brigades, driving them steadily to Goose Creek, where they remained several hours, when they again fell back to effect a junction at Upperville with Jones and W. H. F. Lee, who were falling back before Buford. As Pleasonton neared Upperville the fight increased in severity, and Stuart was driven through the town to Ashby's Gap. The Union loss during the day was 12 killed, 130 wounded and 67 missing. On the 22d Pleasonton fell back to Middleburg and Aldie. The Union loss June 17–21 was 883 killed, wounded and missing; the Confederate loss was 65 killed, 279 wounded and 166 missing, an aggregate of 510. Consult ‘Official Records’ (Vol. XXVII); Doubleday, ‘Chancellorsville and Gettysburg’; McClellan, ‘Life of Maj.-Gen. J. E. B. Stuart.’

E. A. Carman.

MIDDLEBURY, mĭd'l-bĕr-ĭ, Vt., village, county-seat of Addison County, on the Otter Creek, and on the Rutland Railroad, about 40 miles in direct line southwest of Montpelier, the capital of the State, and 35 miles south of Burlington. It is on the eastern slope of the Green Mountains, near the foot-hills in an agricultural and stock-raising region, with large marble quarries in the vicinity. It was settled in 1773, but was abandoned during the Revolutionary War, because it was on the route traversed by many of the British and Indian soldiers, and the lives of the people were constantly in danger. It was incorporated as a borough in 1813 and as a village in 1832. The chief manufactures are lumber and lumber products, wood pulp, foundry products, flour, lime, dressed marble and dairy products. The village is the seat of Middlebury College (q.v.), and has two libraries and the Sheldon Art Museum. Some of the principal buildings, besides the college, libraries and museum are the opera house, courthouse, several churches and the public and parish schools. The water power is valuable, and sufficient for more manufacturing establishments. Since 1877 a revised charter vests the government in a board of trustees elected annually; the subordinate officials are chosen by the trustees. Pop. about 2,000. Consult Swift, ‹History of the town of Middlebury› (Middlebury 1859).

MIDDLEBURY COLLEGE, in Middlebury, Vt., was chartered by act of the Vermont legislature 1 Nov. 1800. The charter has never been amended. The institution is governed by a self-perpetuating board known as «The President and Fellows of Middlebury College.» There are no denominational restrictions and the college has always been non-sectarian. It is the oldest college in Vermont in point of service, beginning its work as a college 5 Nov. 1800 and graduating its first class in 1802, at which time the first academic degrees conferred in Vermont were bestowed. The founders were prominent citizens of Vermont, several of whom lived in Middlebury and adjacent towns. They were counseled by President Timothy Dwight of Yale College and the first president, Jeremiah Atwater, was a Yale graduate. The first building of the college was shared with the Addison County Grammar School and it was 1815 before the college acquired its first permanent structure, Painter Hall. This building was named for Gamaliel Painter, a generous benefactor. The college had a steady growth for half a century and during its first 40 years was easily the first institution in Vermont. Dissensions over the slavery question, followed by the depletion of students during the Civil War, weakened the institution seriously. In recent years there has been complete recovery and rapid growth. The college has now a campus of 140 acres, beautifully situated with commanding views of the Green Mountains and Adirondacks. There are 13 permanent buildings, valued at $708,455. The endowment is $570,941. There has been a net gain in student attendance annually since 1904, the attendance now being 468, or exclusive of the summer session 351. The college gives the degrees of A.B. and B.S. The curriculum is organized in 20 departments. Special attention is given to the training of high school teachers and district superintendents, which is supported by an annual State appropriation. The State of Vermont also supports 60 scholarships. There are no technical or professional courses. The faculty numbers 32, of whom 10 are full professors. The institution was on the first list of the accepted institutions of the Carnegie Foundation and has received the co-operation of the General Education Board. The latest additions to the buildings are a memorial chapel, the gift of ex-Gov. John A. Mead, '64, and a boys' dormitory and commons, the gift of A. Barton Hepburn, '71. Since 1883 the college has admitted women; in 1902 the legislature of the State granted a charter authorizing the establishment of a co-ordinate college for women.

MIDDLEMARCH. To many critics ‹Middlemarch› (1871–72) is the greatest novel George Eliot ever wrote. Its scope, its variety, its maturity and insight, are indubitable. Yet to others it lacks something of the charm and spontaneity of the author's earlier works, and its very inclusiveness and scope lead to a certain confusion of plan and blurring of outline that mark it as artistically imperfect. Whichever view is correct, the novel is admittedly great. Written late in George Eliot's career, it is at once weighty with her considered evaluation of the essential factors in life and rich in her observation and experience of human nature. The plot is the most involved of any that the author has presented, and the characters are numerous even for a Victorian «three-decker.» In general there are two main groups of characters, not, it must be confessed, as closely inter-related as artistically they should be. Dorothea Brooke may be regarded as the centre of one group, and Dr. Lydgate of the other. Both represent the tragedy of high aims that fail to take fully into account the actualities of life. Dorothea sentimentally pines to be the helpmate of a genius; but as the wife of the Rev. Edward Casaubon, who is writing a ‹Key to All Mythologies,› she is disillusioned, and her misery is ended only by the death of her husband. Dr. Lydgate comes to Middlemarch with excellent training, determined to push forward in biological research. However, he marries the attractive but unpractical Rosamond Vincy, is overwhelmed in debts and his possible career fades into nothingness. But George Eliot's view of life is not distortedly pessimistic. Over against the sombre recognition of the inadequacies and weaknesses of humanity must be placed her portrayal of the fine and strong elements. Dorothea herself is genuine and charming fundamentally; the Garths are sterling, and full of vitality. For all its wavering and crowded plot, ‹Middlemarch› is permanently valuable because it represents a realism that endeavors to reflect in just proportions the good and bad in life; a realism, moreover, that does not content itself merely with presenting life, but shrinks not from the task of interpretation and evaluation. Consult Stephen, Sir Leslie, ‹Life of George Eliot› (Chap. 12, New York 1902), and Cross, J. W., ‹George Eliot's Life› (Chap. 16, 3 vols., London 1885).

George B. Dutton.

MIDDLESBORO, Ky., town in Bell County, near the Tennessee boundary line, 48 miles north of Knoxville, Tenn., on the Louisville and Nashville and the Southern railroads. It is situated between the Pine and Cumberland mountains and is patronized as a summer resort. It has iron and coal mining interests and its industrial establishments include iron and coke works. Pop. (1920) 8,041.

MIDDLESBROUGH, mĭd'lz-brō (not Middlesborough), England, a river port, municipal county, parliamentary borough and market town, in the North Riding of Yorkshire, seven miles from the mouth of the Tees, 44 miles north of York. Middlesbrough dates from about 1830, and the development of the coal and iron mines of the neighboring Cleveland Hills and Durham fields. It is distinguished for its municipal enterprises; has wide and regular streets, handsome public buildings, including a fine Roman Catholic cathedral; and extensive and commodious docks. Its chief industries are connected with iron manufactures, producing annually over 2,500,000 tons of pig-iron, of which it is the principal seat in England. It has numerous blast-furnaces and rolling-mills, foundries, engineering works, potteries, chemical works, ship-yards, etc.; and salt is extensively worked, there being a thick bed of rock salt at a depth of 1,300 feet. The borough was incorporated in 1853 and received a county charter in 1888. The borough returns one member to the House of Commons. The chief public utilities are municipally owned. Pop. about 104,767. Consult Reid, 'Middlesbrough and Its Jubilee' (1881).

MIDDLESEX (mĭd'l-sěks) **FELLS,** Boston, Mass., a picturesque hill, wood and lake reservation of the metropolitan park system of «Greater Boston,» enclosing Mystic Lakes; area from 3,000 to 3,200 acres. The Fells are part of the suburban townships of Malden, Melrose and Stoneham north of Boston.

MIDDLETON, mĭd'l-tọn, **Arthur,** American colonist: b. South Carolina, 1681; d. 1737. He was conspicuously engaged in public affairs as a member of the council as early as 1712; and exerted his political influence in favor of popular claims, opposing the lords proprietors, and finally heading the revolution which threw off the whole proprietary government and placed the colony under the immediate protection of the Crown (1719). In 1725 he succeeded Nicholson as acting governor of the colony, which office he held till 1731, when the royal governor arrived; he then retained his position in the governor's council. His administration as governor was partly occupied by war and negotiations with the Spaniards of Florida and the French of Louisiana.

MIDDLETON, Arthur, American patriot, signer of the Declaration of Independence, grandson of the preceding: b. Middletown Place, Ashley River, S. C., 26 June 1742; d. Goose Creek, S. C., 1 Jan. 1787. He was educated in England at the University of Cambridge, then returned to South Carolina for a time and was a member of the legislature, but went abroad again for two years' travel on the Continent. On his final return to America, he established himself as a planter, and soon became one of the leaders of the Revolutionary party. He was one of the most efficient members of the first council of safety, and in 1775 was sent to the Provincial Congress. In 1776 he was sent as a delegate of the State to the Continental Congress, and as such affixed his signature to the Declaration of Independence. He held his seat in Congress until 1777, declined the governorship of South Carolina in 1778 and took the field for the defense of Charleston in 1779. His plantation was devastated by the British and he was made a prisoner after the fall of Charleston in 1780, and was one of the leading citizens who were kept in confinement as hostages. His estate was sequestered, and he was shipped to the castle of Saint Augustine, and thence transferred to the *Jersey* prison ship. Exchanged in the latter part of 1780, he served till the close of the war as a delegate in the Continental Congress, and was afterward elected to the State senate. He was a skilful stenographer, and reported many of the debates in which he participated. He also wrote effective political essays under the signature of «Andrew Marvell.»

MIDDLETON, Conyers, English divine: b. York, or Richmond, Yorkshire, 27 Dec. 1683; d. Hildersham, near Cambridge, 28 July 1750. He was educated at Cambridge and was elected a fellow there in 1706. He married soon afterward, thus losing his fellowship, and for a short time was rector of Coveney in the Isle of Ely, a rectory in the gift of his wealthy wife. He received his D.D. at Cambridge in 1717. He was appointed university librarian in 1721, and was in Italy in 1724–25. His 'Letter from Rome' (1729) dealt at some length upon the adaptation of pagan beliefs and ceremonies in the Roman Catholic Church and was highly praised by the orthodox English clergy, and occasioned great indignation among the Catholics. His controversy with Waterland, in which he urged the then heretical theory that theologians should not attempt to maintain the historical accuracy of the Bible in all instances, brought a storm of criticism and he was obliged to make some qualifications regarding his statements in order to retain his Cambridge degrees. He next engaged upon a life of Cicero, which to a great extent was related in the statesman's own words, and which gained a high reputation as a model of style, but was later found to be largely a plagiarism from a rare book of William Bellenden's 'De Tribus Luminibus Romanorum.' He then returned to the field of theological controversy, publishing his 'Introductory Discourse' (1747), and his 'Free Inquiry' (1748), attacking the miraculous powers supposed to have been inherent in the Church from early times. While this controversy was in progress Middleton died. He attained a high reputation as a master of prose style, Pope, in particular, considering him an authority upon the language; while Parr ranked him next to Addison. His modern rating, however, depends upon his strength as a controversialist; wherein, although he was extremely bitter, he exhibited keenness of perception and contempt for superstition, while in many respects his opinions antedated those later accepted by modern students of religious history. His collected writings, with the exception of the 'Life of Cicero' (2 vols., 1741), were published (4 vols., 1752; 5 vols., 1755). Consult Stephen, L., 'English Thought in the Eighteenth Century' (Chap. 6, 1786).

MIDDLETON, George, American playwright: b. Paterson, N. J., 27 Oct. 1880. He was graduated at Columbia University in 1902 and engaged in literary work. He married Fola La Follette in 1911. He is a frequent contributor to magazines; in 1912 became literary editor of *La Follette's Weekly;* and is author of the plays 'The Cavalier' with Paul Kester (produced by Julia Marlowe, 1902); 'The Wife's Strategy' (produced by Margaret Anglin, 1905); 'The Sinner' with L. Westervelt (produced by Robert Edeson, 1907); 'Rosalind at Red Gate' (1910); 'The Prodigal Judge' (1913); 'Hit-the-Trail-Holliday' with George M. Cohan and Guy Bolton (1915). His books include 'Embers' (1911); 'Nowadays' (1914); 'Possession' (1915).

MIDDLETON, Henry, American patriot, son of Arthur Middleton, 1681–1737 (q.v.): b. South Carolina, 1717; d. Charleston, S. C., 13 June 1784. He was elected to the South Carolina House of Commons and in 1745–47 was its speaker. He was appointed commissioner of Indian affairs in 1755 and served as a member of the council in 1755–70. He was elected a delegate to the Continental Congress in 1774, serving as its president from October 1774 to May 1775. He was president of the Provincial Congress of South Carolina in 1775–76. He was re-elected to the Continental Congress in 1776, but owing to failing health was replaced by his son Arthur, 1742–87 (q.v.), who became a signer of the Declaration of Independence. He was a man of great wealth and wide influence, and was an earnest worker for the independence of the colonies.

MIDDLETON, Henry, American politician and diplomat: b. Middleton Place, S. C., 1771; d. Charleston, S. C., 14 June 1846. He was elected to the State legislature in 1801, serving till 1810. He was soon recognized as a leader, and in 1810–12 was governor of the State. He supported the war policy in 1812, and in 1815 he was elected to Congress, where he served four years. In 1820 he was appointed Minister to Russia, in which capacity he negotiated a treaty regulating trade and fisheries in the Pacific (1824). He returned to the United States in 1830, and retired from public life.

MIDDLETON, Thomas, English dramatist: b. probably in London about 1570; d. Newington Butts, July 1627. Little is known of his life, but his writings testify to the excellence of his education before his entry at Gray's Inn in 1593 (or 1596). Several minor prose works preceded what seems to be his first play, ‹Old Law,› written with Rowley in 1599. From that time on he wrote constantly for the stage, now alone, now with Rowley, Massinger or Dekker. Among these works are several masques, of which the best and most dramatic is ‹The World Lost at Tennis.› Middleton's ‹Witch› is his best known work because of the claim often made since its publication in 1778, that it must have furnished hints for the song of the witches in Shakespeare's ‹Macbeth›; but Middleton's verse, which is particularly reminiscent of ‹Romeo and Juliet,› and his imitation of Shakespeare, as, for example, of ‹Hamlet› and ‹Tempest,› possibly of ‹Pericles,› too, in ‹The Mayor of Quinborough,› make such a view untenable. It is more likely that the songs were taken from Middleton's play and inserted into the acting edition of ‹Macbeth.› The most successful play by Middleton was ‹A Game of Chess,› which satirized the wooing of the Spanish Infanta and was stopped by Privy Council; it packed the playhouses because of its political and Protestant tone. Among his other plays are ‹Michaelmas Term› (1607), a story of city intrigue; ‹A Trick to Catch the Old One› (1608), his best comedy of intrigue; ‹The Roaring Girl›; ‹The Spanish Gipsy,› which, like the ‹Mayor of Quinborough› and ‹A Mad World,› has the Hamlet-like trick of a play within a play; and ‹Women Beware Women,› his best single play. As a rule Middleton is erratic and ill-sustained, and his characters low and coarse, but sometimes wonderfully analyzed. Consult the editions by Dyce (1840) and Bullen (1886), and Swinburne's essay in the *Nineteenth Century* for January 1866. Middleton's best plays appear in a volume of the ‹Mermaid Series› (1887).

MIDDLETON, Canada, a town of Annapolis County, Nova Scotia, 102 miles northwest of Halifax, at the junction of the Dominion-Atlantic and the Canadian-Northern railroads. There are granite quarries in the neighborhood. Concrete products are manufactured. There are medicinal springs, and the vicinity has numerous orchards. Pop. 1,000.

MIDDLETON, England, market town, municipal borough, in Lancashire, six miles northeast of Manchester. Its industrial establishments include cotton and silk factories, dye and print works, ironworks, chemical works, etc., and coal is extensively mined in the vicinity. The church dates from the 12th to the 16th century; the grammar school was founded in 1572; there is a handsome town-hall and free libraries and reading-rooms, parks and a handsome market-place. Gas and electric lighting plants are municipally owned. Pop. 27,980.

MIDDLETOWN, mĭd'l-town, Conn., city, county-seat of Middlesex County, on the Connecticut River, and on the New York, New Haven and Hartford Railroad, about 18 miles south of Hartford. It is opposite Portland, where are valuable brownstone quarries. The places are connected by a long drawbridge. The city was founded in 1650 and the next year was incorporated as a town under the name of Mattabeseck. Two years later the name was changed to Middletown. It was granted a city charter in 1784. For a number of years there was considerable trade with the West Indies, and until 1886 Middletown was the port of entry. In that year the custom-house business was removed to Hartford. Middletown is in an agricultural region in which tobacco is one of the principal products. Abundant water-power has aided in making the place a manufacturing city. The chief manufactures are pumps, bone goods, cotton webbing, hammocks, rubber goods, silks, toys, shoes, chemicals, harness trimmings, locks, marine hardware and silver-plated ware. The educational institutions are the public and parish schools, the Wesleyan University (q.v.), the Berkeley Divinity School (P. E.), opened in 1854, and the Russell Free Library. It is also the seat of the State Hospital for the Insane, and the State Industrial School for girls. The charter of 1882, under which the government is administered, provides for a mayor, who holds office two years, and a city council. The subordinate officials are chosen by the mayor and council. Pop. about 14,000. Consult Adams, ‹Middletown Upper Houses› (New York 1908); Whittemore, ‹History of Middlesex County, Conn.› (New York 1884).

MIDDLETOWN, Del., town in Newcastle County, on the Appoquinomink River and on the Philadelphia, Baltimore and Washington Railroad, 24 miles south by west of Wilmington. It is in an agricultural region in which the chief productions are fruits. The principal manufactures are canned-fruits, wagons and agricultural implements. The waterworks and electric-power plants are municipally owned. Pop. about 1,500.

MIDDLETOWN, N. Y., city, in Orange County, on the New York, Ontario and Western, the New York, Susquehanna and Wilmington, and the Erie railroads, nearly midway between the Hudson and Delaware rivers, and about 66 miles northwest of the city of New York. Middletown was settled about the middle of the 18th century; its location on the Minisink road, the route to the «West,» and half-way between the important rivers of this section, gave the place its name, and its early importance. At first it was included in the Walkill township. In 1848 it was incorporated as a village, and 27 June 1889 was chartered as a city. It is in a fertile agricultural region, and has a large trade in dairy products, livestock and garden produce. It has the New York, Ontario and Western Railroad shops and the chief manufactures are hats, shirts, saws, automobile tires, cut glass, printers' supplies, files, carpet-bags, leather, condensed milk, paper boxes and cigars. Some of the noted public institutions are the State Homœopathic Hospital for insane, the Federal building, churches, public schools (ward schools), one parish school, an excellent high school, Saint Joseph's Academy (R. C.), and the Thrall Public Library. There are two national and one savings bank and one trust company bank. The government is administered under a charter of 1902 which provides for a mayor, who holds office two years, and a common council of nine members, each one of whom holds office two years. The mayor appoints, subject to the approval of the council, the members of the board of health, and the council elects the engineer, city clerk and corporation counsel. Pop. (not including over 2,000 State Hospital inmates), (1920) 18,420.

MIDDLETOWN, Ohio, city, Butler County, on the Miami River, and on the Baltimore and Ohio, the Cincinnati, Lebanon and Northern and the Cleveland, Cincinnati, Chicago and Saint Louis railroads about 25 miles north of Cincinnati. It was settled about 1794. It is in an agricultural section, but is noted for its many paper mills and large steel plants. Pop. 23,594.

MIDDLETOWN, Pa., borough, in Dauphin County, on the Susquehanna River, and on the Philadelphia and Reading and the Pennsylvania railroads, about 10 miles southeast of Harrisburg. It was founded in 1756, and in 1828 was incorporated. It is in a farming region, but it has considerable manufacturing interests. The principal manufactures are shoes, foundry products, stoves, furniture and cars. Stone quarries in the vicinity contribute to the industrial wealth of the borough. Its trade is in the manufactured articles, farm and dairy products. The borough owns and operates the electric-light plant. Pop. 5,920.

MIDEWIN, mē'dĕ-wĭn, or **MIDEWIWIN,** mē'dĕ-wē'wĭn, or **MIDE,** mē'dĕ, or **MEDA SOCIETY,** a secret religious organization of the Algonquian Indian tribe. Both men and women were admitted to it and women as well as men might hold office. A resemblance to the Masonic ritual in its progressive degrees has been remarked. Consult Hoffman, W. J., ‘The Midewiwin of the Ojibway’ in the ‘Seventh Annual Report of the Bureau of American Ethnology.’

MIDGARD, mĭd'gärd, in Scandinavian mythology, the dwelling-place of the human race, formed out of the eyebrows of Ymir, one of the first giants, and joined to Asgard, the abode of the gods, by the rainbow-bridge.

MIDGE. See Black-fly; Gnat.

MIDHAT PASHA, mĭd'hät păsh'â, Turkish statesman: b. Constantinople, 1822; d. Arabia, May 1884. He entered the Turkish government service, was made pasha in 1860, was governor successively of Uskup, Bulgaria and Salonica, and distinguished himself by his wise administration. In 1873 he was for a short time grand-vizier. He aided in deposing the Sultans Abd-ul Aziz and Murad V in 1876, was grand-vizier under Abd-ul Hamid (Dec. 1876–Feb. 1877), and was then banished by the suspicious monarch. Later, however, he was governor of Smyrna, then of Syria. He was tried with other pashas for the murder of Abd-ul Aziz, was found guilty and was sentenced to death; but this sentence was commuted to life imprisonment. He wrote ‘La Turquie: Son Passé et son Avenir’ (1878).

MIDIANITES, mĭd'ĭ-ạn-ītz, an Arab tribe, descended, according to Scripture, from Midian, the son of Abraham by Keturah. They occupied most of the country between the Arabian Gulf and the Plains of Moab. The Midianites were very troublesome neighbors to the Israelites till Gideon's victory over them. Midian ceased to be Egyptian and became Turkish in 1887. Consult ‘Midian Revisited’ (1879).

MIDLAND, Mich., city, county-seat of Midland County, on the Chippewa and Tittabawassee rivers, and on the Michigan Central and the Pere Marquette railroads, 18 miles west of Bay City. Its principal manufactures are shingles, lumber, tubs, hoops, pails, chemicals, bromine and salt. It has a fine new Federal building, banks, grade and high schools. The city is governed by a mayor and city council. Pop. (1920) 5,483.

MID-LOTHIAN, or **EDINBURGSHIRE.** See Edinburghshire.

MIDNAPUR, mĭd-nạ-poor', India, a town and administrative district of Bengal. The town is the capital of the district and is 68 miles by rail west of Calcutta. It is the centre of an important indigo and silk industry, and has manufactures of brass and copper goods. Pop. about 33,200. The district forms the southern part of the Bardwán division, bounded on the east by the river Hugli. It has an area of 5,186 square miles.

MIDNIGHT JUDGES, or **APPOINTMENTS,** a term applied to executive appointments or nominations made by President John Adams, the last night of his administration. Congress had passed a bill authorizing the appointment of 18 new United States judges, and Adams with the consent of the Senate appointed judges to fill these newly created vacancies. They were known as «Adams Midnight Judges.» The new law was repealed early in Jefferson's term and the judges lost their offices.

MIDRASH (Hebrew, from *darash,* to make research), among the Jews, is the general name given to the exposition or exegesis of the

Scriptures. When such writings first arose is not known, but the most flourishing period of midrashic exegesis was from about 100 B.C. to 200 A.D. The term midrash expressed «any and every ancient exposition on the law, psalms and prophets, disquisitions that took the form of allegorical illustration, homiletics or practical commentary.» Thus in its most general meaning it expressed the whole uncanonical Jewish literature, including the Talmud, down to the compilation of the book Jalkuth in the 13th century, since which time the term gradually ceased to be applied to rabbinical writings.

MIDRIFF (A.-S. *mid*, middle; *hrif*, abdomen), the diaphragm (q.v.).

MIDSHIPMAN, in the American and British navy, a young officer who has previously held the position of a naval cadet. The cadets require to be nominated before they can come forward for competition. After two years' training on board a training-ship, the cadet is expected to pass the examinations appointed. If he gain a first-class certificate he becomes a midshipman at once, otherwise he has to serve for 6 to 12 months at sea. A midshipman after four years and a half may become a sub-lieutenant; he then studies at the Naval College, is trained in gunnery and torpedo practice, takes a course in pilotage and then may become a lieutenant.

MIDSHIPMAN, a California coast-fish of the genus *Porichthys*. See CABEZON.

MIDSHIPMAN EASY, Mr., a nautical romance by Capt. Frederick Marryat, published in 1836. It narrates the adventures of a spoiled lad, the son of a so-called philosopher, who cruises about the world, falls in love, has misfortunes and at last good luck and a happy life. The incidents themselves are nothing, but the book is entertaining for its «character» talk, and because the author has the gift of spinning a yarn.

MIDSUMMER EVE. See JOHN'S, EVE OF SAINT.

MIDSUMMER NIGHT'S DREAM, A. First printed in 1600 and mentioned by Meres in 1598. ‹A Midsummer Night's Dream› was probably written in 1594, or even earlier. It was doubtless written for some wedding festival as it has many of the characteristics of a masque. The incidents connected with Theseus and Hippolyta were taken from Plutarch's ‹Life of Theseus› and perhaps Chaucer's ‹Knights Tale,› while the fairy story which makes up such a large part of the play was Shakespeare's transformation of the somewhat crude elements of mediæval folklore. The first and last acts take place in Athens at the palace of Theseus, and the other three acts in the forest near Athens. Theseus and his queen fit into the story in so far as they celebrate their nuptials, and as they are interested in the love affairs of Demetrius and Helena, Lysander and Hermia; they are brought into the forest only by their love of the chase, which is realistically portrayed. The well-known words of Theseus upon «the lunatic, the lover and the poet, as of imagination all compact,» are in striking contrast with the fantastic fairies that really dominate the play. Even further removed from fairy-land are the prosaic mechanics who represent, with all the characteristics of low comedy, the story of Pyramus and Thésbe. By their rehearsal in the forest they are caught for a moment in the magic web of Oberon, Titania and Puck. Under the same influences fall the Athenian lovers, who after unfortunate experiences are brought to the happy conclusion of their dreams. The title of the play, as indeed the major part of the story and the background, suggest the tone, the atmosphere, of the play. It is the magical midsummer-night with the moon in the sky that forms the appropriate setting of the mystery, the fantasy, and the unreason of fairy-land. Oberon, Titania and Puck, along with the other incarnations of the beauty and magic of nature, have fixed in the popular imagination the principal elements of fairy-land. The fact that they were represented by boys on the Elizabethean stage gave to these creations the spirit of childhood that has been lost in the modern stage representation. No analysis can suggest the delicacy, or the beauty, or the charm of these airy nothings to which Shakespeare has given a local habitation and a name.

EDWIN MIMS.

MIDWAY ISLANDS, North Pacific Ocean, so named from being midway between Asia and America, are the northernmost islets of the Hawaiian group, extending about 1,800 miles north by west of Honolulu. The islands have come into prominence as the intermediate station of the American-Pacific cable to the Ladrone and Philippine islands via Honolulu. The group consists of a low coral atoll 18 miles in circumference, enclosing Sand Island, Eastern Island and two islets. Sand Island, the largest, is one and three-fourths miles long, three-fourths of a mile wide and has an average elevation of from 3 to 10 feet above sea-level, the highest point attaining 43 feet. Eastern Island is one and one-fourth miles long, one-half mile wide and from 6 to 12 feet high. Both islands are partly covered with coarse grass and bushes, the breeding ground of the tern or sea-swallow. Good water is obtained by sinking wells, while fish of many varieties, turtles, crabs and crawfish, etc., abound in the lagoon; sea-birds also are easily caught. The islands are inhabited only by the employees at the cable stations. From 1887–89 a shipwrecked crew lived here for 14 months until rescued, losing, however, several of their number from scurvy. A short distance west of the islands a submarine mountain rises 2,200 feet from the ocean bed to within 82 fathoms of the surface, and between the islands and Guam is an abyss of over 4,900 fathoms, one of the deepest in the world.

MIDWIFE FROG. See OBSTETRICAL FROG.

MIDWIFERY. See OBSTETRICS.

MIELATZ, Charles Frederick William, American etcher: b. Breddin, Germany, 24 May 1860; d. 2 June 1919. He came to the United States when a child and was educated in Chicago, studying drawing at the Chicago School of Design, and painting under F. Rondel, Sr. He was elected a member of the National Academy of Design and as instructor in etching there exerted a considerable influence over the younger artists of his time. He became widely known for his etchings, dry points, aquatints and lithographs. He executed a large number of views of New York as well as of rural, woodland and marine scenes. Among his works may be mentioned the etchings ‹The Battery›; ‹Rainy Night, Madison Square›; ‹Kingsbridge on the Harlem›; ‹Arch of the Cathedral of Saint John the Divine›; ‹Saint Paul's›; ‹New York from the Harbor›; ‹Chelsea Docks›; ‹The Naval Arch›; ‹Poe's Cottage at Fordham›; ‹Across the Fields, Narragansett›; ‹A Glimpse of New Haven›; ‹In the Gardens, Georgian Court, Lakewood›; ‹Near the Golf Links, Lakewood›; the dry points, ‹Falls of Pawtucket›; ‹Fisherman's Luck›; ‹A Mill at Block Island›; the aquatints, ‹Foggy Day on Shore›; ‹Winter Night›; and the lithographs, ‹Bowling Green›; ‹Fifth Avenue.›

MIELZINER, mĕl'zĭn-ėr, **Moses,** American rabbi and educator: b. Schubin, Germany, 12 Aug. 1828; d. Cincinnati, Ohio, 18 Feb. 1903. After studying at the University of Berlin he became rabbi of a congregation in Waren, Germany, and then head of a theological school in Copenhagen. In 1865 he was called to the rabbinate of a New York synagogue, which he held until 1873, when for six years he was principal of a private school besides co-operating in the Emanu El Preparatory School. In 1879 his real educational work was begun in the United States when he was appointed professor of the Talmud at the Hebrew College, which position he held until his death. As teacher he was clear, exact and thorough. His published works include ‹The Jewish Law of Marriage and Divorce› (1884); ‹Selections from the Book of Psalms› (1884); ‹Slavery among the Ancient Hebrews› (1894); ‹Introduction to the Talmud› (1884 and 1903); ‹Legal Maxims and Fundamental Laws of the Civil and Criminal Code of the Talmud› (1898); ‹Rabbinical Law of Hereditary Success› (1900).

MIER, Mexico, commune in state of Tamaulipas, 95 miles northeast of Monterey, on the Rio Grande. Pop. 7,114.

MIERES, Spain, city in the province of Oviedo, 12 miles by rail southeast of Oviedo, on the river Caudal. It is situated in a mountainous region with heavy forests and fertile land. It has coal, iron, sulphur and cinnabar mines, and iron and chemical works. The town has also a trade in fruit, timber and livestock. Pop. 27,866.

MIERIS, mē'rĭs, **Frans van** (THE ELDER), Dutch painter: b. Leyden, 12 April 1635; d. there, 12 March 1681. He was originally a pupil of the glass painters A. Torenvliet and G. Dous, and eventually became so famous as a canvas artist that the Grand Duke of Tuscany and other noblemen ordered pictures from him; his work was remarkable both for refinement of handling and elegance of design. His portraits and genre pictures, in which both nobility and bourgeoise are represented, are not conspicuous for striking and original characterization. Only two or three figures appear in most of his genres, and his compositions of this kind are delicate and smooth to a degree that renders them almost inanimate. There are portraits of himself and his wife in the gallery of The Hague, and in the Pinakothek at Munich, which latter collection is especially rich in examples of this master, among them ‹An Oyster Breakfast›; ‹Lady Playing a Lute›; ‹The Trumpeter›; ‹The Sick Woman.› Many of his pictures are to be met with in the galleries of Paris and Dresden such as ‹The Artist›; ‹A Lady Painting›; ‹Love's Message›; ‹The Music Lesson›; and in the Berlin Gallery is his ‹Young Lady before a Looking-glass.›

MIERIS, Frans van (THE YOUNGER), grandson of the preceding, Dutch painter: b. Leyden, 24 Dec. 1689; d. there, 22 Oct. 1763. He painted genre and portraits after the manner of his father, who had produced a number of small club pictures, and of his grandfather. He did more service perhaps by his literary work than by his pictures, which have the ancestral fault of superficiality. He wrote ‹Histoire der Nederlandsche Vorsten› (1732–35); ‹Groot Charter-book der Graven van Holland, van Zeeland en Herren van Vriesland› (1753–56); and ‹Handvesten der Stad Leyden› (1759).

MIFFLIN, Thomas, American soldier and politician: b. Philadelphia 1744; d. Lancaster, Pa., 20 Jan. 1800. He was by birth a Quaker; was graduated at Philadelphia College in 1760; entered public life in 1772 as a member of the Pennsylvania assembly; and in 1774 was elected a delegate to the Continental Congress. In 1775 he entered the army with the rank of major, and as colonel and first aide-de-camp to Washington accompanied him to Cambridge. He subsequently held the appointment of adjutant-general, and in the spring of 1776 was commissioned as brigadier-general. He fought in the battle of Long Island, and by his energy succeeded in the latter part of 1776 in raising considerable reinforcements in Pennsylvania to recruit Washington's army. He was present at the battle of Trenton, and did good service in driving back the enemy's line of cantonments from the Delaware. In 1777 he was made a major-general, and in the same year became an active member of the faction organized for the purpose of placing Gates at the head of the Continental army, and known in history as the Conway Cabal (q.v.). The project failing, he resigned his commission, and in 1782 was elected to Congress, of which body he became president during the following year. In this capacity he received from Washington the resignation of his commission as commander-in-chief. In 1785 he became speaker of the Pennsylvania legislature, and in 1787 he was a delegate to the Constitutional Convention. In October 1788, he succeeded Franklin as president of the Supreme Executive Council of Pennsylvania, which position he filled for two years; and from 1790 to 1799 he was governor of the State. In 1794, while holding this office, he rendered important assistance to Washington in quelling the Whisky Insurrection (q.v.).

MIFFLIN, Warner, American reformer: b. Accomac County, Va., 21 Oct. 1745; d. near Camden, Del., 16 Oct. 1798. When a boy on his father's plantation he became convinced of the evil of slavery, and when he himself became a slave owner, he freed all his slaves and paid them for their past services. He was a Quaker, and traveled widely, preaching against slavery. It was largely through his efforts that the

Quakers came to oppose slavery, and many followed his example in freeing their slaves. On account of his religious principles he opposed the Revolutionary War, and at the time of the battle of Germantown interviewed both General Washington and General Howe to impress upon them the evils of the war. In 1782 he was instrumental in securing a law in Virginia which allowed for emancipation of slaves; in 1783 he presented a memorial to Congress in regard to slavery, and in 1791 another memorial on the same subject to the President and Congress, which was the cause of a sharp debate on the right of petition. Shortly afterward he published a series of essays defending his position in the matter.

MIFFLIN, Fort. See FORT MIFFLIN.

MIGDOL (Hebrew, a tower). Egypt, town mentioned in Jeremiah xliv, 1; xlvi, 14, as in lower Egypt; in Ezekiel xxix, 10; xxx, 6, as the northern limit of the country, opposite Syene; as a station on the route of the Israelites to the Red Sea in Exodus xiv, 2, and in Numbers xxxiii, 7. It is also probably the magdolum of the ‹Antonine Itinerary,› situated 12 Roman miles from Pelusium.

MIGNARD, Pierre, French painter and engraver: b. Troyes, November 1612; d. Paris, 20 May 1695. He studied in Bourges under Jean Boucher and in Paris under Simon Vouet. In 1636 he went to Italy and spent most of his time in Rome, whence he was surnamed «The Roman» (Le Romain). He imitated Annibale Caracci, and among other portraits, including those of many Roman nobles, painted likenesses of Popes Urban VIII and Alexander VII. In 1654 he went to Venice where his success as a portrait painter continued. On being summoned to Paris by Louis XIV he painted portraits of the young king and of Mazarin and afterward was commissioned to decorate the cupola of the church of Val de Grace with over 200 figures of prophets, martyrs, etc. This work, the largest piece of fresco painting in France, soon lost the beauty of its coloring, owing to the painter's want of familiarity with the art of working on a wet plaster ground. He subsequently produced some paintings for the palace of Versailles and was made director of the royal art collection and superintendent of the manufacture of the Gobelin tapestry. His pictures suffer from the faults of his day; they are stiff and conventional; but glow with the warm and harmonious coloring of the Venetian school. His portraits are the best of the early French school. A remarkable collection of his works is to be found in the Louvre, but the Berlin Museum possesses the finest of his portraits, that of Maria Mancini. Consult Lebrun Dalbaume, ‹Etude sur Pierre Mignard› (1878).

MIGNE, Jacques Paul, French priest and editor: b. Saint-Flour, Cantal, 25 Oct. 1800; d. Paris, 25 Oct. 1875. He was educated at Orleans, was ordained a priest in 1824 and had charge of the parish of Puiseaux in the diocese of Orleans until 1833 when he went to Paris and founded *L'Univers religieux,* which afterward became *L'Univers* under the direction of Veuillot. In 1836 he disposed of his interest in that publication and established a publishing house for the production of religious books in inexpensive editions. While his work as a publisher was of vast scope much of it was superficial and prepared at too high a rate of speed to be accurate. An exception is the ‹Patrology› which was under the direction of the scholar Benedictine J. B. Pitra, and which covers many works not included in other collections nor produced in special editions. It was published as ‹Patrologiæ cursus completus› (Latin series, 221 vols., 1844–55; Greek series, in Latin, 85 vols., 1856–61; Greek series, with Greek text and Latin trans., 165 vols. 1857–66). Among other publications are ‹Scripturæ sacræ cursus completus› (28 vols., 1840–45); ‹Collection des auteurs sacrés› (100 vols., 1846–48); ‹Encyclopédie théologique› (171 vols., 1844–66), etc. The Migne publishing plant was a total loss by fire in 1868, but it was rebuilt, and in 1876 it was sold to Garnier Frères, who also purchased Migne's copyrights.

MIGNET, François Auguste Marie, frän-swä ō-güst mä-rē mēn-yā, French historian: b. Aix, Provence, 8 May 1796; d. Paris, 24 March 1884. He was educated at Avignon; studied law in Aix; went to Paris in 1822 after winning a prize from the Academy of Inscriptions by his essay on French institutions, government and legislation in the time of Saint Louis; joined the staff of the *Courrier Français;* lectured on modern history at the Athenée; was elected to the Academy in 1836; and after the Revolution of 1848 lost the place he had held for 18 years as archivist of the Foreign Office. His most important work was a ‹History of the French Revolution› (1824). Besides this he wrote biographies of Franklin (1848), of Mary Stuart (1851), and of Charles V (1854). Consult Trefort, ‹Mignet und seine Werke› (1885).

MIGNON, French term of endearment (darling, favorite, pet), sometimes used as a given name. 1. A mysterious Italian girl, the daughter of an aged harpist, who dies in despair through unrequited love in Goethe's ‹Wilhelm Meister's Lehjahre.› 2. Opera by Ambroise Thomas, founded on ‹Wilhelm Meister,› with words by Carré and Barbier, produced in Paris in 1866, in London in 1870 and in New York in 1871. 3. A term of opprobrium applied to certain favorites of Henry III, of France, youths of frivolous habits and effeminately fashionable dress, popularly credited with dissolute morals and generally hated because of the king's lavish generosity to them. Among them were Quélus, Saint-Mégrin, Maugiron, Epernon and Joyeuse.

MIGNONETTE, mĭn-yō-nĕt', a genus (*Reseda*) of annual and perennial herbs of the family *Resedaceæ.* The species, of which there are about 50, are natives of western Asia and the Mediterranean region. They have simple or compound leaves, and terminal spikes of small, pale, usually greenish flowers. Less than half a dozen species are cultivated, the most important being the common mignonette (*R. odorata*), a universal favorite both in gardens and in greenhouses because of its fragrant flowers. It is a branching annual herb of decumbent habit when in its prime, and will thrive in any cool, moist, fairly rich soil, when partly shaded from the noon-day sun. For outdoor blooming the seeds are sown successionally from early spring to midsummer, and for winter blossoming from that time forward at intervals of three or four weeks.

MIGRAINE, OPHTHALMIC MIGRAINE, or SICK HEADACHE, a very widespread affection, also known as megrim, hemicrania or bilious headache. It is a vaso-motor disturbance; in other words, one in which the nerves which expand or contract the arteries and blood vessels are affected, thus restricting the flow of blood. The number of happenings which may cause this malady is exceedingly great, including such diverse causes as the merely physical ones of severe blows, falls, fast movements, sudden alteration of temperature or of atmospheric pressure. Migraine may also be caused by chemical stimuli such as nicotine, and by the secretions of various glands of the body such as the thyroid. It is often, too, caused by some other deep physiological alteration, such as that experienced in extreme fatigue, or that coming from some other disease such as meningitis or tumors. It may also have as chief cause some undue emotional strain as in great anger, in fear (which produces important changes in metabolism, q.v.), in disappointment or in chagrin. The vital point about the mental causes is that they may not always be in consciousness, but may be solely in the unconscious, and will therefore be quite unknown and unknowable to the average person, unless he can receive treatment at the hands of an experienced psychoanalyst. (See PSYCHOANALYSIS). If the causes act through the cerebral sympathetic nervous system, they may produce spasms of the vaso-motor muscles such that the blood pressure is increased in the brain.

The study of the worst forms of the disease alone has enabled investigators to correlate the multiform symptoms into a consistent picture. Fortunately the worst forms are not the commonest, which may be termed abortive forms. In these abortive forms now one and now another of the symptoms appear in individual cases, some having many or most of the symptoms, but in different attacks. One patient, for instance, is on record who in 15 years had at different times all the variations of the disease which have been reported.

The commonest abortive attacks of migraine begin with chilliness, sometimes accompanied by cold feet and pinched face. Apprehension, depression and general wretchedness then follow, sometimes accompanied by a peculiar defect of sight which is known as scotoma. This is a spot in the visual field, quite distinct from the quite ordinary "blind spot," but one which interferes with the sight to a varying extent, and goes through different phases, sometimes within the short space of 20 minutes, constituting, in the cases where it does occur, the prelude to the actual pain in the head. The scotoma begins only as a slight blurring, noticeable especially when reading. The attention directed to it shows a cloudy spot which shifts with the eye, as it changes its direction. Gradually the spot expands into more or less crescent shape, usually being found in the left eye. The interference in vision is however sometimes found to affect only the upper half of the field of vision, while in rarer instances a temporary total blindness occurs.

Another important disturbance associated with migraine is that of speech. Not only is the ability to pronounce certain words affected, but the comprehension is also sometimes interfered with. Inability to write is not unknown and also a disturbance of the auditory images used in singing. A case has even been described in which unsteadiness of gait was coupled with a sensation that the body or particular parts of it were doubled.

The headache itself is, however, the most important symptom and has an infinite variability as to its location, its quality, its duration and its intensity. The commonest form appears a quarter or a half an hour after the appearance of the other phenomena including the scotoma, and is generally confined to one side of the head, hence its name: migraine (from *hemicrania,* Greek for "half head"). But cases occur where it involves both sides or may be in the front or back of the head. In many cases the eyes alone are the seat of the pain, while in others the pain may be in the neck. The quality of the pain is described generally as lancinating. Some sufferers become hysterical, rolling on the floor and holding their heads with both hands, and shrieking with pain. Others with less acute suffering describe the pain as beating or thumping, particularly when stooping or requiring to do any violent exercise. All the phenomena of the pain indicate a change in pressure of blood within the brain, a change which may be either an increase or a decrease. The pain is aggravated in diverse ways in different patients, sometimes increasing on the taking of alcohol, on smoking, on eating, which sometimes on the contrary helps, on being subjected to sudden and loud noises, or to strong light. It has been found, too, that certain odors increase the pain, such as that of cooking and of certain drugs like chloroform or ether. The vaso-motor disturbances which accompany all cases of migraine are manifested in the coldness, paleness and gooseflesh, evidences of constriction in the calibre of the blood vessels, or in the redness of skin and even discharge of blood from various parts of the body. The secretions are frequently affected.

The connection between migraine and the mental factors which are above enumerated as among its causes is a matter which is being investigated at the present day through the technique of psychoanalysis (q.v.), which has unearthed much material going to show that the left sided headache represents an unconscious conflict relating to some love affair, while those on the right side are associated with fantasies concerning the nutritive libido. As a preliminary to the onset of the sickness the general conscious situation of the patient may show a slight or almost unnoticeable or even a profound change, varying from violent agitation to mild depression. In the observation of one specialist 25 per cent of the patients showed psychical symptoms, and while others show a smaller proportion, the presence of the purely mental element indicates that an important if not exclusive factor in the causation of the malady is the unconscious conflict. Treatment consists in removing as far as possible all the physical causes known to produce migraine, such as eye-strain, adenoids, diseased turbinates, constipation, dysmenorrhea, etc., or gastro-intestinal disorders, and if the migraine still persists, there is very good reason to believe that the condition is the result solely of the unconscious conflict. In this case the patient should receive analysis from an experienced psychoanalyst.

SMITH ELY JELLIFFE.

MIGRATION. The term migration is often used very loosely in popular writings about animals, so that it seems wise to define it as limited in the present article to: (1) The annual change of residence by a species with the change of seasons from winter to summer or the reverse; (2) irregular mass-movements of a species under pressure of famine, over-population of a locality, or some more obscure influence. While these classes have been enumerated in the order of their prominence to our eyes, especially in the behavior of birds, it will be well to consider the second sort of migrations first, as these sporadic cases may throw light on the more regular phenomena, and how they came to be habitual.

Insects.— An eminent entomologist tells us that certain butterflies, as our milkweed frittilary (*Anosia plexippus*) and the cotton moth (*Aletia argillacea*), pass northward in the United States for hundreds of miles in spring, and again in huge swarms southward in autumn; but whether the individuals are the same is not determined. (See MILKWEED BUTTERFLY). Among other butterflies periodical migrations occur, as in movements of vast columns across the Isthmus of Panama out to sea, and flights miles in breadth have been observed to cross Ceylon, the individuals occupying several continuous days in their passage. Wallace observed the swarming of pierid butterflies in the Indian Ocean, and Clark in Venezuela, the vast throng composed of males moving steadily eastward for several days in the face of the trade winds.

The late Dr. A. S. Packard, whose special studies of the habits of the Rocky Mountain locust about 1880 were so valuable, reported that that destructive insect is migratory in certain seasons favorable to the species when overproduction occurs; the young on hatching, after having devoured every green thing at hand, are forced, when becoming winged, to rise in enormous swarms and sail on the wings of the wind for hundreds of miles to other regions where they lay their eggs. The next year's brood sometimes returns to the original spawning ground to lay their eggs. The same thing is characteristic of similar locusts in Syria and central Africa.

Crustacea.— The members of several families of crabs, mostly tropical, have acquired the power of living out of water, and even of wandering extensively inland, but regularly return to the sea, sometimes in marching hordes, to deposit their eggs in the water, after which they go back to the highlands. See LAND CRABS.

Fishes.— Many kinds of fishes are regular migrants; the anadromous families, such as those of the shad, herring and salmon, annually ascend the rivers to spawn, whence in some cases they return to the sea, in others never get back, but their young, after the succeeding winter, go back to salt water. Certain fishes retire to the deeper or warmer parts of the ocean during the winter, but in early summer travel toward the shore-shallows, or to the cool north, in vast swarms; and the same is true of a large variety of other marine creatures, including some of the humblest and most minute forms, in which cases the direction of the mass-movements are largely determined by the ocean currents. Moreover there occurs in the ocean a regular movement of deep-sea forms toward the surface in the night, the animals sinking again as daylight approaches. Fishermen in the north Atlantic and on the coast of Norway are familiar with the vast influx in the spring of such fishes as herrings, cod, plaice and capelan. The eminent Norwegian naturalist, G. O. Sars, concluded that some of these fish-migrations were undertaken in order to obtain food, and others for the purpose of reproduction. «When the capelan gathers in millions on the coast-banks of Finmark or Labrador, when countless numbers of cod approach the banks of Lofoten, and when the herrings flock to western Norway, they migrate to spawn. The fat-herring collecting off the coast of Nordland, and the cod gathering around the shoals of capelan in the Barents Sea, are examples of feeding-migrations.»

Sea-turtles have a similar history, going regularly toward shore in the breeding season to deposit eggs in the beach sand.

Mammals.— The reader will have perceived that most of the foregoing cases are not examples of true migration because the element of habitual return is absent, or at best a very few survive to return; or else the movement, when seasonal and regular, is purely local, such as going to the nearest shore for spawning; or is merely the pursuit of traveling prey. In this class must be put most of the so-called migrations of mammals. From time to time certain small animals, as lemmings, field-mice, squirrels and the like, develop enormous numbers in some region (or formerly did so, before civilization was so worldwide) and overflow in great «armies» into neighboring parts of the country, where they gradually expire. In the plains regions of the world a lack of good pasture in one place will often cause movement of antelopes, bisons, etc., to some better district in great herds; and in other situations the wild animals are accustomed to go up into the hills in summer and come down to the shelter of the valleys in winter, but these are local movements. The only examples of real migration afforded by the mammals are the case of certain bats that regularly journey every year between the tropics and more northern climes, and the case of the caribou and, to a less extent, the reindeer. These deer do make a real fall migration from the barren Arctic coast to the margin of the forested region southward and go back in the spring. It is to the birds, then, that we must turn for a study of migration in the stricter sense of the term, and even here it is only partial as regards many species and groups.

Migration of Birds.— This subject is so large that we can give no more than a superficial sketch, following in general the lines of investigation conducted by the late Wells W. Cooke, of the United States Biological Survey, who devoted almost his whole life to a study of this phase of ornithology as exhibited especially in North America.

The motive or cause of the periodical migration of birds has excited inquiry since ancient times, and at present two different methods of explaining it are in vogue. The opinion is general that in Pleistocene times, just previous to the advance of the cold climate and finally to the great accumulations of ice and snow over the northern parts of the world, the whole of the northern hemisphere possessed a mild climate, and birds of every sort dwelt comfortably all the year round throughout virtually its whole extent. The coming of the Glacial Period so affected the north, as to limit more and more the residence in winter of birds there, although in summer they might venture somewhat toward it, when vegetation and insect life annually revived. As the ice advanced very gradually, now and then receding, but on the whole enlarging itself, these enforced northward and southward movements of the birds increased both in distance and duration, until migration became a fixed habit with all birds whose life was affected by the change of climatic conditions. Finally most northern birds were restricted all the year to middle America and the Mediterranean region and southern Asia. But the habit of migration had been formed, and when the glacial ice began to retreat toward its present position, the birds annually followed its receding margin, until at last they had established their present long and diversified migration routes.

Thus far all theorists are in substantial agreement. The divergence is as to the prevailing motive. One school argues that a longing to continue their inherited habit of residence in the north, and individually to return to their birthplaces, is the incentive that compels them to leave the tropics and make a journey, often of surprising length, every spring. The other school maintains that «the birds' real home is in the Southland»; that that region becomes overcrowded, and the birds in annually flying northward are seeking a region where there is less crowding and less competition for food. The truth perhaps lies in a combination of these influences, varying in intensity with different kinds of birds. It is an important circumstance, especially with reference to the second theory, that no similar migration occurs southward from the tropics to Bolivia and Argentina, whose plains and mountains offer a poor supply of bird-food, and not much more from the equatorial to South-African districts. «The conclusion is inevitable,» Cooke believes, «that the advantages of the United States and Canada as a summer home, and the superb conditions of climate and food for successful rearing of a nestful of voracious young, far overbalanced the hazards and disasters of the journey thither. It must be remembered too that the migratory species have acquired various adaptations relating to their migrating habits that tend to fit them more and more to endure the exertion and danger required; also that the regular routes followed by each species are the products of thousands of generations of experience, and presumably represent the easiest way in each case.

Phenomena of Bird-Migration.— In the restricted space of this article it is impossible to go into detail as to the general subject, and attention must be confined mainly to what appears in North America. Australasia and the South Pacific islands share to some extent in the annual movements of continental species, but have an inter-insular migratory system of their own. «In Europe,» says a recent reviewer, «and central Asia there are numerous routes, at least nine, according to Palmen. Of these one begins on the Siberian shores of the Polar Sea, Nova Zembla, and the north of Russia, and passes down the western coast of Norway to the North Sea and the British Isles; another arising in Spitzbergen follows much the same course, but is prolonged past France and Spain to the west coast of Africa. Many migrants wintering in North Africa (Algeria, etc.) have flown there from northern Russia, by way of the Baltic Sea, Holland, passing up the Rhine Valley, and crossing to the Rhone, the column splitting on reaching the Mediterranean, one line of migration passing along western Italy and Sicily, a second crossing by way of Corsica and Sardinia, the third by southern France and eastern Spain. Egypt receives its winter visitors from the Russian river-valleys of the Obi and Volga, the line crossing the Black, Bosporus and Ægean seas to the Nile Valley. One important migration-route is to and from India along the Danube Valley and across Persia.»

An important fact to consider at first is that the migratory habit is possessed in its completeness by comparatively few birds, and these belong almost wholly to a single order, that of the *Passeres,* or insect-eating song-birds. The exceptions are mainly seafowl and certain water-birds. Even in these groups two classes are to be found, one of species that are resident the year round in the regions they severally occupy; and the other whose migrations are of slight extent. Even in the northern half of the United States many birds are present in winter, some of which are those that retreat from the North only so far as driven by deep snow and excessive cold; while the Southern States have a longer list of resident birds, supplemented in winter by many kinds that moved only a little way southward to escape the dearth of food at that season in the snowy parts of the country. This shows that in respect to distance, migration varies from a distance almost as great as the breadth of the globe (the Arctic tern passes annually from Patagonia to Alaska, and back again) to no change of residence at all, even on the Arctic coast and islands.

Northward Movement in Spring.— Let us now consider the actions of the real migrants, who have been spending the winter in tropical America, on the arrival of spring. Nothing that we can see compels them to move, yet they abandon the delights of their winter home and proceed northward as soon as the proper time comes. This «proper time» seems to have no relation to the weather or to food-conditions there in the tropics, which are almost changeless, but is determined by the weather and food conditions the bird will find when it arrives at its northern destination, if the season there be an average one. This varies with the requirements of different birds, so that some start much earlier than others. Thus the ducks and geese, which ask only that the rivers and ponds in the north shall be free from ice, come to us much earlier than do the warblers and flycatchers that must wait until flowers are in bloom and insects numerous. As the last are the most numerous they come in crowds soon after the leaving-out of the northern woods and orchards.

Not all, however, pursue the same route, although each species keeps to its traditional path until it arrives in the district suitable to it, when it scatters. The configuration of continents, narrowing into a mere isthmus between North and South America, permits only a very narrow land-path for the migrants between their winter and summer resorts, yet most of those who winter south of Panama crowd along this narrow neck. Certain shore-birds, confident of their strength, strike straight north from Brazil to Nova Scotia, and a few species follow the line of the Antilles from Venezuela to Florida. Birds whose destination is California and northward follow the western coast of Mexico, and those aiming at summer homes in the Rocky Mountain region pass straight north through central Mexico and across the desert, or skirt the eastern coast of Texas and the plains. All these are habitual routes for certain species. The great body of migrants, whose songs are later to be heard in the eastern United States and Canada, fly straight across the Gulf of Mexico from Yucatan to landings on the northern shore all the way from eastern Texas to Florida. Arrived there — and as a rule this is about daylight, the journey from Yucatan having taken but one night — they spread northward along two main channels, one up the coast eastward of the Alleghanian Mountains (diverging into these uplands at each river valley); and two up the Mississippi Valley, separating into bands that ascend every tributary, and rapidly cover the whole country, while those bold species, surprisingly many in number, who are content only in the subarctic zone, hasten on to Alaska and down the Mackenzie Valley. The point to keep in mind in this general sketch is that every species pursues the same route every year, and sometimes it is far from the most direct one. The speed of travel is not great as a rule. The birds must feed by the way, and this food must be found as a rule by daylight; therefore, most species travel during the night, and are often delayed by foggy, rainy nights or by cold storms. The swallows, swifts, nightjars, hawks and some others that capture their prey on the wing feed as they go and probably rest at night. Those bound for the far north must and do move more rapidly than the southern breeders; and Cooke has gathered some very interesting statistics on this matter.

Autumnal Migration.— The autumnal return of the birds presents some very different features. It begins in the far north before any change in weather or food suggests the necessity of departure, and is led by male birds, after whom the mothers and young follow as soon as they have strength to travel. The movement is far less direct and hurried than the spring flight. They make a long stage by night, flying sometimes a mile or more above the earth, and drop down at dawn to feed and rest, then loaf along. The members of each species gather gradually into the regular route, which in many cases is quite different from that followed northward in May; and those that are inclined to flocking at this season form large companies that go on together, striking out at last from the Gulf shore to cross in a night that space of dark water, or disappearing in the Mexican forests.

How do Birds in Migration find Their Way?— We have seen that they follow definite routes; also that these in places lead across wide spaces of water; also that the routes in some cases differ according to season; and had we been able to give more details it would appear that often these routes are very eccentric. Moreover, they travel mostly at night; and finally certain species cross areas of ocean hundreds of miles wide, and far from land, as when golden plovers fly from Nova Scotia to hundreds of miles wide, and far from land, as in the case of the curlews that migrate between Australia and New Zealand. It is also pleasingly evident that birds return year after year to the same grove, dooryard and nesting-place. How do they do it?

It was formerly taught that they followed landmarks, such as coast lines, ranges of mountains and large river-courses, which are visible even on clear nights from a great height, and doubtless these are aids to the day-fliers and when the sky is clear. But many lines of migration cut across such landmarks, instead of follow them, and others stretch across wide plains and vast water-spaces. Other theories, as of magnetic influences, etc., are without value. It appears plain that birds are guided by an innate sense of direction. This need not be esteemed miraculous, for in a lesser degree it is possessed not only by various other animals, but by wild men, especially those who dwell in a forested region, where in following game they would become lost daily had they not a faculty for orientation. The direct testimony to such a faculty in savage mankind, and comparison of the evident ability of many animals in this direction, makes its presence in the minds of birds easily credible, the more so as the sense is by no means infallible, since birds sometimes become completely bewildered when buffeted about at sea by high winds. Add the elements of observation and memory and a sufficient explanation is at hand of how migratory birds find their way.

Bibliography.— An early treatise on this subject of much value is by Alfred Newton in his ‹Dictionary of Birds› (London and New York 1893–96). A more recent review is a part of the introduction of Dr. Frank M. Chapman's ‹Handbook of Birds› (2d ed., New York 1912), which includes an extensive bibliography. The latest and most important results of study are in the writings of W. W. Cooke, summarized in Bulletin 185 of the United States Department of Agriculture (Washington 1915).

Ernest Ingersoll.

MIGUEL, mē-gĕl', Dom **Maria Evaristo**, Portuguese pretender, son of John VI of Portugal: b. Lisbon, 26 Oct. 1802; d. Castle Bronnbach, Baden, 14 Nov. 1866. He was brought up in Brazil, and upon the accession of his father repeatedly raised rebellion as head of the Absolutists. In 1826 after his father's death he was made regent, but proclaimed himself king, attempted to keep Maria de Gloria, the real heir to the throne, who had been offered to him in marriage, out of the kingdom, and was successful until Dom Pedro of Brazil came to the aid of his daughter Maria, defeated Miguel and forced him to leave Portugal. Miguel is usually described by the faction hostile to him as ignorant, vicious and drunken, but his coreligionists make him a model prince.

MIKADO (Japanese *Mi*, «exalted,» *Kado*, «gate»), the ancient and poetic title of the Japanese emperor, in origin identical with «Sublime Porte» as used of the Ottoman sultan, that is, probably transferred to the ruler and judge from the gateway of his palace, at which he did justice. The word mikado was never used as a separate title for a spiritual ruler; the incorrect idea to the contrary results from the well-known historical fact that much of the temporal power of the Mikado was long usurped by shoguns or generals, who, however, always admitted that they derived their power from the Mikado. The present Mikado, Yoshihito (q.v.), is the 122d (or 124th) of his line, which dates back to 660 B.C.; of him the title «Mikado» is less used than Tenshi Sama, «Son of Heaven,» or Shu-jo, «Supreme Master.» See JAPAN.

MIKADO, The, or THE TOWN OF TITIPU, a comic opera in two acts, libretto by W. S. Gilbert, music by Sir Arthur Sullivan; first production, Savoy Theatre, London, 14 March 1885; first appeared in America at the Museum, Chicago, 6 July 1885. The plot is simple burlesque without the infusion of any Eastern imagery. The Mikado, a highly moral ruler, has issued an edict condemning to death every man found guilty of flirtation «unless connubially linked.» To evade this stern sentence the citizens of Titipu hit upon the idea of appointing one thus condemned (Ko-Ko, the tailor) to the office of executioner, with the result that he could not behead the next man until he had first executed himself. It being necessary eventually to execute some one, Ko-Ko, who is engaged to Yum-Yum and is also first on the list of the condemned, finds a substitute in Nanki-Poo (the Mikado's son in disguise), who had gone into temporary obscurity to avoid marrying the elderly Katisha. Nanki-Poo agrees to suffer execution a month hence provided he can be married to Yum-Yum for that period. Legal complications follow, and in the end Nanki-Poo is forgiven and weds Yum-Yum, and Ko-Ko saves himself by marrying Katisha. An amusing character is Pooh-Bah, «Lord High Everything Else.»

MIKANIA, also known as **WILLUGHBEIA** (both Neo-Latin from the names of J. C. Mikan and Francis Willughby, respectively), a genus of composite plants of the tribe *Eupatorieæ* and sub-tribe *Agerateæ*. It is widespread throughout tropical and temperate America and grows either in an erect shrub or in twining vines. The genus numbers more than 150 recognized varieties, all natives of the warmer regions of America, except one species which grows in Asia and tropical Africa. The plant is characterized by opposite leaves, heart-shaped or triangular, toothed at the base and with petioles. The flowers are small and white, pinkish or yellowish. The tropical types, *M. amara, M. cordifolia* and *M. guaco*, have a high reputation in South America for the cure of snake bite, and administration of a medicine made from them is also supposed to render one immune to snake bite. There is no scientific proof of the efficacy of the herb either as remedy or preventive. *M. scandens* is the familiar climbing hempweed, with abundant pink flowers, growing in moist soil from Long Island to Texas.

MIKHAILOV, Mikhail Larionovitch, Russian author: b. Ural Mountains, 1826; d. Siberia, 1865. He was educated at Petrograd and engaged in literary pursuits as a translator, journalist and writer of fiction. His political sympathies caused his exile to Siberia. He was a contributor to *Sovremennik* (*The Contemporary*) and an able advocate of the reforms of the self-emancipation era. His collected translations and writings were published (3 vols., 1858–59).

MIKHAILOVSKI, Nikolai Konstantinovitch, Russian author and sociologist: b. 1842; d. 1904. He belonged to the school of thinkers which became famous in Russia in the seventies and eighties as fearless exponents of political and economic reforms. He was a contributor to the *Otechestvennya Zapiski* (*The Annals of the Fatherland*) from 1869 until it was suppressed in 1884. He became coeditor of *Sěvernvi Vestnik* (*The Northern Messenger*) in 1873, and from 1890 until his death in 1904 he was coeditor of *Russkoye Bogatstvo* (*Russian Treasure*) with V. G. Korolenko. His collected writings were published (Petrograd 1913).

MIKKELSEN, Aksel, Danish educator: b. Hjörring, 14 Aug. 1849. He introduced the Swedish system of sloid schools into Denmark, organized schools and seminaries on the system, which teaches manual training as an aid in developing the pupils physically and mentally as well as affording a basis of technical training. From 1907 he was inspector of the sloid system in Denmark. Author of ‹Hvad er Slojd› (1886); ‹Hvordan arbejder Slojdskolen› (1886); ‹Opdrageren› (1891–92); ‹Slojlære› (1894); ‹Arbejdsstilinger› (1896), etc.

MIKKELSEN, Ejnar, Danish explorer: b. Vester Brönderslev, Jutland, 20 Dec. 1880. He was a member of the Smdrup expedition to Christian XI Land, East Greenland, in 1900, and in 1901–02 served with the Baldwin-Tiegler expedition to Franz Josef Land. In partnership with Leffingwell he organized an Anglo-American polar expedition in 1906, and succeeded in determining the position of the continental shelf of the Arctic Ocean. His expedition to the north coast of Greenland in 1909–10 resulted in his recovery of the records of the lost explorers Mylius-Erichsen and Höeg-Hagens, and in proving the non-existence of Peary's Channel. Author of ‹Conquering the Arctic Ice› (London 1909); ‹Lost in the Arctic› (1913); ‹Mylius-Erichsen's Report on the Non-Existence of Peary's Channel› (1913), etc.

MIKLOSICH, Franz von, Austrian philologist: b. Luttenberg, Styria, 20 Nov. 1813; d. Vienna, 7 March 1891. He took his degree in philosophy at Gratz and in law at Vienna; and for a time practised law at Vienna, soon, however, abandoning that profession for the study of the Slavonic languages. He was appointed to a place in the Imperial Library in 1844 and retained it until 1862, also serving as professor of Slavonic philology at the University of Vienna in 1849–86. He was a man of profound scholarship and not only revolutionized modern Slavonic philology but made important contributions to the knowledge of the Albanian, Gypsy, modern Greek, Hungarian and Rumanian languages. He was a member of the Academy of Vienna and a corresponding member of the French Academy of Inscriptions. His first contribution to Slavonic philology was his review, in 1844, of Bopp's ‹Comparative Grammar.› From that time he issued a large number of works, not only on the Slavonic but on other languages, all of high importance, and among which the most notable are ‹Vergeleichende Grammatik der Slawischen Sprachen› (1852–74); ‹Etymologisches Wörterbuch der Slawischen Spracken› (1886).

MILAN, mĭl'ạn or mĭ-lăn', second city of Italy, the capital of the province of Milan, an archiepiscopal city on the Olona, about 90 miles by rail northeast of Turin. It is situated in a beautiful and fertile plain between the Adda and Ticino, which feed several canals, one of which, encircling a considerable portion of the interior of the city, divides it into two unequal parts. The town is built in the form of an irregular polygon, and is surrounded, except on the castle side, by a wall or rampart called the Bastione, encircled on the outside by a fine road shaded by chestnut-trees. Suburbs have sprung up beyond this circuit, and the general railway station is also outside. The city is entered by 11 gates, several of which are magnificent. The streets leading from these gates are wide, well paved and lighted and traversed by electric street car lines; the lateral streets are less commodious. The houses are built mostly of brick, but have often a handsome and showy exterior. The principal street is the Corso Vittorio Emanuele, a prolongation of the new and handsome Corso Venezia, together leading from the cathedral to the Porta Venezia; other good streets are the Corso Porta Romana, Via Torino, Via Dante, etc. The chief square is the Piazza del Duomo, in which stands the Duomo or cathedral; and another is the Piazza della Scala. Besides fine public gardens (Giardini Pubblici) there is a large public park (Parco Nuovo) occupying an area that was long a drill-ground, and was previously the site of the citadel and connected works. This has been finally laid out and planted, and an artificial lake and mound have been constructed. Adjoining these is an amphitheatre, capable of containing 30,000 spectators. The castle — recently restored and now converted into a museum of art and antiquities — fronts the park on one side; at the opposite side is the Porta Sempione with the fine Arco Sempione or Arco della Pace, a triumphal arch of white marble.

Among the public edifices of Milan the first place belongs to the Duomo or cathedral, a magnificent structure, inferior in magnitude to Saint Peter's at Rome, but in some respects not an unworthy rival. It is built of white marble, and though exhibiting a somewhat incongruous mixture of styles, in which the ancient Gothic occasionally gives way to the modern Italian, is one of the most impressive ecclesiastical edifices in the world. The Duomo in its present form was commenced in 1387, and is not yet entirely completed. Its form is that of a Latin cross, divided into five naves, terminated by an octagonal apsis, and supported by 52 octagonal pilasters of uniform size, except four, which, having to bear the cupola, are larger. It is 486 feet long, the tower is 356 feet high, it occupies an area of 14,000 square yards and can hold 40,000 people. Around the exterior are 4,500 niches, of which above 3,000 are already occupied by statues; in the interior everything is of the most imposing and gorgeous description. Among the other remarkable edifices are the basilica of Sant' Ambrogio, founded by Saint Ambrose in 387, and though completely repaired in 1631, still retaining much of its original form and containing many relics of the ancient building embedded in its walls; the churches of Sant' Eustorgio, San Lorenzo, Santa Maria della Grazie, with a cupola and sacristy by Bramante, and the celebrated ‹Last Supper› by Leonardo da Vinci; Santa Maria della Passione, a majestic edifice, with excellent paintings and a magnificent mausoleum; San Paolo; San Carlo Borromeo, etc. Among the palaces are the Palazzo Reale or La Corte, adorned with numerous frescoes and surmounted by a lofty tower; the archiepiscopal palace, adjoining the cathedral; the Palazzo di Comando Militare; the Palazzo Marino, now the Municipio, a colossal structure; the Palazzo Ciani, completed in 1861, and adorned with heads of Victor Emmanuel, Garibaldi, etc.; and the Palazzo di Brera or Delle Scienze Lettere ed Arte, containing the Pinacoteca or picture-gallery, with a very valuable collection of paintings and statutary, and containing also the library of the Academy, 300,000 volumes. Besides this library Milan possesses the Ambrosian Library, the earliest, and still one of the most valuable, public libraries in Europe. There is also a valuable museum of natural history and one recently founded, of theatrical relics, a world-famous conservatory of music, a military college, a theological seminary, a veterinary school. The principal structure erected in recent times is the Galleria Vittorio Emanuele, a kind of covered street connecting the Piazza del Duomo with the Piazza of La Scala Theatre. It is 320 yards long, contains handsome shops and is adorned with 24 statues of celebrated Italians. Milan has a number of theatres; La Scala is the second largest theatre in Europe, and accommodates 3,600 spectators. The principal benevolent endowments are the Ospedale Maggiore (founded 1456), richly endowed, and occupying a vast range of buildings in the Gothic style, with accommodation for 4,000 patients, and several other hospitals for the cure of diseases. Since it formed part of United Italy no town has more rapidly increased in commercial and industrial activity and in population than Milan. The spinning and throwing of silk employ a large number of hands. Other important articles of manufacture are machinery, locomotives and railway cars, automobiles, boilers, electrical apparatus, tobacco, cotton, lace, carpets, hats, glass, earthenware, chemicals, white-lead, jewelry, etc. Besides these, corn, rice, cheese and wines are the principal articles of trade. The municipality is one of the most progressive in Europe; great street improvements have been carried out; there is an adequate street railway service giving communication with the neighboring communes; and, while there is still much overcrowding and congestion of population, the death rate has been greatly reduced. Milan is the see of an archbishop, the seat of courts of primary resort, criminal and mercantile courts, and a Court of Appeal for all Lombardy. The United States is represented by a consul.

The foundation of Milan is attributed to the Insubrian Gauls; but the first distinct notice of it occurs 221 B.C., when it was subdued by the Romans, under whom it acquired so much importance, that in the division of the empire attributed to Constantine the Great it ranks as the second city of Italy. In the middle of the 5th century it was sacked by the Huns under Attila, and again in the following century by the Goths. Greater horrors yet awaited it; and the Goths, who had been driven out by Belisarius, having regained possession by the aid of the Burgundians, gave it up to the flames and put almost all its inhabitants to the sword. Rebuilt, it again became very flourishing under the Lombards and Charlemagne. Arrogance grew with its prosperity, and Milan lorded it so haughtily over the neighboring towns and republics, that in 1162, when the Emperor Frederick I, whose supremacy it refused to acknowledge, had resolved to take summary vengeance, the inhabitants of Pavia, Cremona, Lodi, Como and Novara eagerly hastened to the task and razed it to the ground. The cruelties practised produced a reaction, and in 1167 the famous Lombard League was formed at Pontita, and among other important results succeeded in bringing back the Milanese; and the city, again rebuilt, became even more populous and influential than before. It long continued, however, to be torn by internal factions, headed by the leading nobility, among whom the Visconti at last gained the ascendency, and ruled it from 1395 till 1447. They were succeeded by the Sforzas, whose rule ended in 1535. Milan passed next into the possession of the Spaniards. At the close of the War of Succession it was allotted to Austria (1714). Under Bonaparte it became the capital of the Cisalpine Republic, of the Italian Republic, and of the Italian kingdom. In 1815 it was restored to Austria, and continued the capital of the Austro-Italian kingdom until 1859, when by the Peace of Villafranca Lombardy was ceded to Piedmont. Pop. about 663,000.

Bibliography.— Ady, C. M., ‘A History of Milan under the Sforza’ (New York 1907); Beltrami, L., ‘Reminiscenze di storia e d'arte nella città di Milano’ (Milan 1862–67); Noyes, Ella, ‘Story of Milan’ (in the ‘Mediæval Town Series,’ London 1908); Shaw, Albert, ‘Municipal Government on the Continent of Europe’ (New York 1906); Valeri, F. M., ‘Milano’ (Bergamo 1906).

MILAN, Mo., town and county-seat of Sullivan County, on the Quincy, Omaha and Kansas City and the Chicago, Burlington and Quincy railroads, about 100 miles east by north of Saint Joseph. It is in an agricultural and stock-raising region, and in the vicinity of bituminous coal fields. The chief manufactures are flour and lumber. Milan is the headquarters of a division of the Quincy, Omaha and Kansas City Railroad, and the shops of the road are located here. The trade is principally live-stock, grain, lumber and flour. Pop. 2,395.

MILAN, Tenn., city in Gibson County, on the Illinois Central and the Louisville and Nashville railroads, about 95 miles northeast of Memphis. It is in an agricultural and lumbering region; the principal products are cotton and fruit. The chief manufacturing establishments are flour-mills, fruit-canning works, cotton gins and barrel factory. It has a college and good schools. Pop. (1920) 2,057.

MILAN DECREE, issued by Napoleon I, at Milan, 18 Feb. 1801, cutting off Great Britain from all connection with the Continent.

MILAN EDICT, issued by Constantine the Great at Milan, 313 A.D., granting toleration to Christianity and all other religions in the Roman Empire.

MILAN OBRENOVITCH I, ō-brĕn'ō-vĭch, king of Serbia: b. Jassy, 22 Aug. 1854; d. Vienna, 11 Feb. 1901. He was cousin to Michael Obrenovitch III, Prince of Serbia, by whom he was adopted on the death of his parents. He was educated in Paris at the Lycée Louis le-Grand and upon the assassination of Michael in 1868 he succeeded him as Milan Obrenovitch IV, Prince of Serbia, under a regency headed by Ristitch. In 1872, at the age of 18, he took over the government, retaining, however, the services of Ristitch. He carefully balanced political relations between his country and Austria and Russia, so strengthening his position that after the Russo-Turkish War he was successful in having Serbia's independence declared and himself proclaimed as Milan Obrenovitch I, king of Serbia, in 1882. He then entered into a secret treaty with Austria, by whom his subsequent administration of affairs was largely influenced. He improved transportation facilities and developed the country to a considerable extent, but without due reflection as to expense of the measures, so that heavy taxes and increased military service influenced the country against him. This state of affairs, coupled with his notorious private life and his offensive quarrels with his queen, Natalie, caused great public dissatisfaction and in 1889 he suddenly decided to abdicate in favor of his 13-year-old son, Alexander. He returned to Belgrade in 1894, was officially reconciled to the queen and undertook the reorganization of the army under the sovereignty of his son. He was appointed commander-in-chief in 1897, and is credited with greatly improving the military service in Serbia. Upon the marriage of his son, Alexander, to Draga Mashin, in 1900, Milan resigned his position as commander-in-chief of the army and was banished. He went to live in Vienna and died there in the following year. See SERBIA.

MILANÉS Y FUENTES, José Jacinto, hō-sā' yä-kēn'to mē-län-āś ē fwān'tās, Cuban poet: b. Matanzas, 16 Aug. 1814; d. there, 14 Nov. 1863. He was self-taught, being a poor clerk and later a blacksmith's helper. But when he was 19 some of his verses were published and his excellent drama, ‘El Conde Alarcos,’ which appeared in 1838, won him a comfortable position. Several other plays followed, notably ‘Una Intriga paternal.’ But his early hardships had undermined his reason; he traveled for relief in the United States and in Europe in 1848 and 1849, and spent his last years in melancholia broken only occasionally by intelligent literary effort. Consult the biographical sketch in the *North American Review* for 1849.

MILAN CATHEDRAL

MILAZZO, mē-lät'sō, or **MELAZZO,** Sicily, a fortified seaport city in the province of Messina, on a promontory 21 miles by rail west of Messina. It has a good harbor and carries on a trade in fruit, wine, cattle, fish and sulphur. It has a theatre, a technical school, a library containing over 10,000 volumes, a city hospital; and the building now used as a jail was originally a 13th century castle. Milazzo is the ancient Mylæ off which in 260 B.C. the Romans won a great sea-fight over the Carthaginians. Here also Garibaldi, 20 July 1860, with 2,500 men, defeated 7,000 Neapolitans and compelled the garrison to evacuate the fortress. Pop. of commune 16,569.

MILBANK, Joseph, American philanthropist: b. New York, 1848; d. 7 Sept. 1914. He was the son of Jeremiah Milbank, the millionaire organizer and builder of the Chicago, Milwaukee and Saint Paul Railroad, and at an early age became a director of the road. He inherited, with his sister, Mrs. Elizabeth Milbank Anderson, a fortune of great extent, which he further augmented by his own efforts in banking and railroad enterprises. With his sister he gave the Milbank Memorial Chapel to Teachers' College, and Milbank Memorial Hall to Barnard College, Columbia University; the Jersey City People's Palace; founded a Social Welfare Bureau at a cost of $650,000; and contributed $500,000 to the Children's Aid Society. Their benefactions totaled $5,000,000.

MILBURN, William Henry, American clergyman: b. Philadelphia, 26 Sept. 1823; d. Santa Barbara, Cal., 10 April 1903. At five he suffered an accident which caused partial and finally complete loss of sight. He was educated at Illinois College (Jacksonville, Ill.); in 1843 became a Methodist itinerant preacher; was largely active in the South; and for a time had charges at Montgomery and Mobile, Ala. In 1845 he was elected chaplain of the House of Representatives, and he served as such in 1853, 1885 and 1887. In 1893 he was made chaplain of the Senate. He lectured with success throughout the United States and in 1859 in Great Britain. He was generally known as the «blind preacher.» Among his writings are ‹Rifle, Axe and Saddle-Bags› (1857); ‹Ten Years of Preacher Life› (1859); and ‹Pioneers and People of the Mississippi Valley› (1860), all based on his Western experiences.

MILCOM, national god of Ammon (1 Kings xi, 5, 33; 2 Kings xxiii, 13). Other references occur in Jeremiah xlix, 1, 3, and in 1 Kings xi, 7, where the spelling varies slightly but the identity is clear. The name appears to be derived from the West Semitic word *melek,* «king»; although *melek 'am,* «king of the people,» is also considered. The name of the deity has not been found in inscriptions and nothing is known of the religion. There is no base for the supposition that human sacrifice was practised by the Ammonites, as it was by the Moabites to their god Molech, which deity is often confused with Milcom. The Ammonites worshiped on the Mount of Olives while the Moabites performed their religious rites in the valley of Hinnom. The Ammonites and their religion disappeared in the migrations and political upheavals which occurred in the districts to the east of the Jordan shortly prior to the Christian era.

MILDEW, specifically, any fungus belonging to the group *Erysiphaceæ,* the powdery or true mildews, and *Peronosporaceæ,* the downy or false mildews; loosely, many plant diseases, especially the rusts and smuts of cereals, and some not of fungous origin; vaguely, molds of any kind upon preserved fruit, clothing, walls or other materials, the origin of which is more or less organic. The powdery mildews develop mostly upon the outside of the host plants, which they enter only by means of their sucking organs of attachment (haustoria). In warm weather they develop innumerable spores upon erect branches and later produce thick-walled resting spores which germinate in the spring. Upon the host plants they usually appear as a sort of bloom, but later they often cause distortion of the leaves and not infrequently the death of the host. Being mainly upon the surface they may be combated with any fungicide (q.v.), and often with sulphur, either in the form of powder or vapor (not burned) evaporated without flame. This method is widely practised in greenhouses. Some of the best known are rose mildew (*Sphærotheca pannosa*), gooseberry mildew (*S. mors-uvæ*), hop mildew (*S. castagnei*), cherry, pear and apple mildew (*Podosphæra oxycanthæ*), wheat mildew (*Erysiphæ graminis*) and grape mildew (*Unicinula spiralis*).

The downy mildews all live within the tissues of the host plant, appearing outside the surface only when producing summer spores (conidia) which usually give a downy appearance to the infected spots. The resting spores are produced internally and make their escape in the following season when the tissues of the host (leaf or other part infected) have decayed. They cannot be combated like the preceding, because of their habit of feeding internally. Fungicides (q.v.) may be applied to prevent attacks, however, and this, together with the destruction of leaves in autumn and general cleanness of the premises, are believed to be the only safeguards. Among the best known and most destructive are Potato rot, blight, or mildew (*Phytophthora infestans*), lettuce mildew (*Bremia lactucæ*), damping-off fungus (*Pythium debaryanum*), downy mildew of the grape (*Plasmopara victicola*), radish mildew, also found on other members of the *Cruciferæ* (*Cystopus candidus*), melon and cucumber mildew (*Plasmopara cubensis*) and onion mildew (*Peronospora schleideniana*).

The rusts and smuts which are sometimes called mildews are discussed elsewhere. The mildews, so-called, which appear upon leather, wall-paper, cloth, etc., belong to various other groups. Since they are generally seen only where dampness prevails, especially in cellars and closed rooms or houses, they may be prevented more or less effectually by the adequate ventilation of such places. And having gained a foothold in these places they may be destroyed by liberal applications of whitewash, in which copper sulphate or sulphur have been mixed, or where this cannot be applied, by burning sulphur in the closed quarters. This last remedy may also be used where cloth is attacked. Awnings, sails, etc., should be thoroughly dry before being stored or folded for any considerable time. They may also be soaked in a solution of copper sulphate and then dried. Until this is washed out by rain it will act both as a preventive of attack and will often save fabrics if not too far gone.

MILE (Latin *mille,* a thousand, a Roman mile being 1,000 paces), a measure of length or distance. The English statute mile, fixed in the reign of Queen Elizabeth, is 1,760 yards. The geographical mile, which is commonly used by the navigators of all nations, is one-sixtieth part of a degree at the equator. In many countries the kilometer now holds the same position as the English statute mile in Britain. The following are some of the principal standards of miles or leagues which are or have been in use in the principal countries of Europe:

Kilometer	1,093.6	yards.
Ancient Roman mile	1,614	"
Modern Roman mile	1,628	"
English statute mile	1,760	"
Tuscan mile	1,808	"
Ancient Scottish mile	1,984	"
Geographical mile	2,028.4	"
Italian mile	2,028.4	"
Irish mile	2,240	"
French posting league	4,263	"
Spanish league (judicial)	4,635	"
French league	4,860	"
Portuguese league	6,760	"
German short mile	6,859	"
Flanders league	6,864	"
Spanish league (common)	7,416	"
German geographical mile	8,113.6	"
German (new imperial)	8,202	"
Old Prussian mile	8,237	"
Danish mile	8,244	"
Swiss mile	9,153	"
German long mile	10,126	"
Swedish mile	11,700	"

The English statute mile is generally used in the United States.

MILEAGE, a term used in the United States, for fees paid to certain officials, such as members of Congress, of State legislatures, special commissioners and others, for their traveling expenses, at so much per mile. The system has led to gross abuses, each senator and representative estimating for himself the distance he had traveled. There is now a fixed table of mileage. The term mileage was formerly applied in the United States to railroad transportation, sold in tickets good for 1,000 miles of travel. These tickets were issued in book form, convenient for the pocket, and known to travelers as mileage books. In 1903 a system of interchangeable mileage tickets was issued, good for transportation on any one of eight different railroad lines in the Eastern States. Early in 1919 this mileage system was changed, all partly used books recalled and instead there was issued what is known as script, the coupons representing different amounts of money rather than miles. This system was an advantage to the traveler as the script could be used on any of the roads then under control of the Federal government.

MILELLI, Domenico, dō-mā'nē-kō mē-lĕl'lē («Conte di Lara»), Italian poet: b. Catanzaro, Italy, 1841; d. 1905. He was educated for the priesthood, but finding literature more to his liking turned his attention to writing, which is in subject of a paganish character. He was one of the leaders of the class called *Veristi.* Among his works are ‘In giovinezza’ (1873); ‘Odi pagane’ (1879); ‘Il rapimento di Elena’ (1882); ‘Verde antico’ (1885).

MILES, George Henry, American dramatist: b. Baltimore, Md., 31 July 1824; d. Thornbrook, Md., 23 July 1871. He was graduated from Mount Saint Mary's College, Emmitsburg, Md., and practised law in Baltimore for several years, after which he devoted himself to literature. In 1850 his ‘Mohammed’ was awarded the $1,000 offered by Edwin Forrest for the best drama by an American author. In 1859 he was appointed professor of English literature at Mount Saint Mary's College, where he remained until his death. His works comprise ‘Señor Valiente’ (1859); ‘Christine, a Troubadour's Song’ (1866); ‘Abu Hassan the Wag’ (1868), etc.

MILES, Nelson Appleton, American army officer: b. Westminster, Mass., 8 Aug. 1839. He was a clerk in a Boston mercantile house at the outbreak of the Civil War in 1861, and left his business to raise a company of volunteers, and enter the army as lieutenant in the 22d Massachusetts regiment. In 1862 he was promoted to the rank of colonel, commanding the 61st New York regiment. He was engaged in the battles of the Peninsula, before Richmond and at Antietam, and in every battle of the Army of the Potomac, with one exception, until the surrender of Lee at Appomattox Court House. He was distinguished in the battles of Chancellorsville, Wilderness, Spottsylvania Court House, Reams Station, Richmond campaign of 1864 and many other important battles of the war; and, at one time, at the age of 25, was in command of the Second Army corps, numbering 25,000 men. He was wounded three times, most severely at the battle of Chancellorsville. In May 1864 he was promoted brigadier-general and in 1865 major-general of volunteers.

At the close of the war he entered the regular army and was commissioned colonel of the 40th United States Infantry, and attained the rank of brigadier-general in 1880 and of major-general in 1890. He successfully conducted several important campaigns against the Indians and did much to open up for civilization large portions of the West. In 1874 and 1875 he defeated the Cheyennes, Kiowas and Comanches in the Staked Plains country; he also subjugated the hostile Sioux and other Indians in Montana, driving Sitting Bull across the frontier and breaking up the bands that were led by him and other chiefs. In December 1877, after a forced march over a distance of more than 160 miles, he captured Chief Joseph and his tribe of Nez Perces after a hard-fought battle of four days in northern Montana; in 1878 he intercepted and captured Elk Horn and his band on the edge of the Yellowstone Park. In 1886 he subjugated and forced to surrender Geronimo, Natchez and the band of Apaches that had made a large portion of the Southwest uninhabitable, thus restoring peace and prosperity to Arizona and New Mexico. For his services up to this time he received the thanks of the legislatures of Kansas, Montana, New Mexico and Arizona. Later he settled the Indian troubles in the Dakotas, saving the country from a serious war that had threatened it for years. In 1894 he was in command of the United States troops sent to Chicago at the time of the railroad strike; and in October 1895 succeeded to the command of the United States army. He represented the army at the scene of the Turco-Grecian War and at Queen Victoria's Diamond Jubilee in 1897. In 1898 he conducted the brief campaign in Porto Rico with ability, taking possession of the island with trifling loss; and in June 1900 was promoted to the rank of lieutenant-general. In December 1901 he was officially reprimanded for publicly expressing his approval of Admiral Dewey's report on the Schley case. In 1902 he made a tour of inspection to the Philippines and on his return filed a report which called forth considerable controversy by its denunciation of some of the abuses he had found in the conduct of military affairs there. In August 1903 he was retired from active service. He wrote ‘Personal Recollections’ (1896); ‘Military Europe’ (1898), besides magazine articles and official military reports.

MILES CITY, Mont., city and county-seat of Custer County, 150 miles northeast of Billings, on the south bank of the Yellowstone River, and on the Northern Pacific and the Chicago, Milwaukee and Saint Paul railroads. It is situated in an important grazing country and is the centre of the Montana cattle district. It has an extensive trade in cattle, sheep and horses. There are modern waterworks and lighting facilities, high school, State industrial school, an Ursuline convent, public library and a hospital. Pop. 7,937.

MILES GLORIOSUS (Lat., «braggart soldier»). (1) Comedy by Plautus. (2) Name slyly applied by Ferdinand of Bulgaria at a banquet when toasting Kaiser Wilhelm II of Germany who mistook it for a compliment.

MILES O'REILLY. See Halpine, Charles Graham.

MILESIAN TALES, a form of anecdotal satire current in Miletus and Asia Minor about a century B.C. The tales are of an erotic character, but are important in so far as they form a link in the chain of the development of satirical romance, exemplified in Petronius' ‘Supper of Trimalchio’ and Apuleius' ‘Story of Cupid and Psyche.’ Six volumes of the tales were collected by Aristides of Miletus and were later translated into Latin by Cornelius Sisenna (119–67 B.C.), but of these only fragments remain. They have been compared to the French *fabliaux* and the tales of Boccaccio. Consult Müller, ‘Fragmenta Historicum Græcorum’ (IV); Bücheler's small edition of Petronius (Berlin 1882); Peck, H. T., translation of Petronius' ‘Dinner [Supper] of Trimalchio’ (New York 1898).

MILESIANS, mī-lē'shĭ-ạnz, or mī-lē'-zhạnz, early colonists of Ireland, a portion of whose inhabitants, according to Irish tradition or legend, are descended from Milesius, a fabulous king of Spain, whose two sons conquered the island several thousand years before Christ, establishing a new nobility. This was the last of the traditional prehistoric colonizations of Ireland.

MILETUS, mī-lē'tŭs, Asia Minor, an ancient city opposite the mouth of the Meander on the Latmic Gulf, which, inhabited by Carians, was in existence prior to the colonization of the coast by the Ionians. The Ionians are said to have taken forcible possession of the town, massacred the men and taken the women as their wives. The extent of the harbors of Miletus, one of which could contain a large fleet, soon raised the town in the hands of the Ionians to a place of importance, and it became one of the first cities and republics of Asia Minor. Its commerce covered the Mediterranean and extended to the Atlantic. It had upward of 75 colonies, most of which were on the coasts of the Euxine. On the rise of the Lydian kingdom repeated attempts were made to conquer it. It finally recognized the soveignty of Crœsus, and paid tribute. A similar arrangement was made with Cyrus, which saved it the calamities of a contest with the Persians. Civil dissension, however, had long been rife. The Persians were compelled to intervene, and committed the government to the most peaceable landowners. The city revolted against the Persians 500 B.C. It was taken by storm 494 B.C., was plundered and the inhabitants massacred or transported. It recovered its independence in 479 B.C., after the battle of Mycale. It yielded for a time to the supremacy of Athens, but ultimately threw off the yoke. It stood an assault by Alexander the Great 334 B.C., part of the city was destroyed, but the conqueror did not interfere with its government. From the time of its subjugation by the Persians it had never recovered its early importance; but it still continued to enjoy some commercial prosperity under the Romans until the time of Saint Paul, who visited it twice, as recorded in Acts xx, 17 and 2 Tim. iv, 20. It was finally taken and destroyed by the Turks. From the change made on the coast by the deposits of the river the site of the city was with difficulty excavated by the Berlin Museum in 1899, and the foundations of various parts of the city exposed.

MILFOIL, or MILLEFOIL. See Yarrow.

MILFORD, mĭl'fōrd, Conn., town in New Haven County, at the mouth of Wepowaug River, on Long Island Sound and on the New York, New Haven and Hartford Railroad, about 10 miles southwest of New Haven. The place was settled by people from Wethersfield and New Haven in 1639. The Indian village was called Wepowage. Milford became a part of the «Colony of New Haven» in 1644, and in 1664 the town became a part of Connecticut. The chief industries are oyster cultivation, farming, seed-growing, the manufacturing of electrical supplies, telephone apparatus, shoes, straw hats and silverware. It has a beautiful, well-kept park, several fine churches and school buildings, and the Taylor Library, which has about 10,000 volumes. In 1889, on the 250th anniversary of the settlement of Milford, a memorial bridge was erected. Pop. (1920) 10,193.

MILFORD, Del., town in Kent and Sussex counties, on Mispillion River, and on the Philadelphia, Baltimore and Washington Railroad, about 62 miles south of Wilmington. A settlement was made here in 1678–79 and in 1787 the town was incorporated. It is the trade centre for a fertile agricultural region in which fruit growing receives special attention. The industries of the town are connected with the farm and orchard products. Pop. (1920) 2,753.

MILFORD, Mass., town in Worcester County, on the Charles River, and on the New York, New Haven and Hartford and the Boston and Albany railroads, about 17 miles southeast of Worcester. It was settled in 1669 and was then a part of the east precinct of Mendon. On 11 April 1780 it was incorporated as a separate town. It is in an agricultural region, but the town has considerable manufacturing interests. In the vicinity are large granite quarries. The chief manufactures are foundry and machine-shop products, silk, boots and shoes, thread, boot and shoe trees, straw goods and bone cutters. The granite quarries contribute to the industrial wealth of the town. The town has a fine high school, good public and parish schools and a public library. Town meetings, held usually twice a year, administer the government. Pop. 13,471.

MILFORD, N. H., town in Hillsboro County, on Souhegan River, and on the Boston and Maine Railroad, about 27 miles south by west from Concord and 15 miles southwest of Manchester. The chief industries are connected with manufacturing, quarrying granite, lumbering and agriculture. The principal manufactures are canvass, leather, lumber, piano keys, harness, furniture, quarry machinery, post-office equipment, soap, paper boxes, ice-cream freezers, toys and novelties. There are a national and a savings bank, also a building and loan association. The government of the town is in the hands of a board of selectmen. The waterworks are municipally owned. Pop. 4,000.

MILFORD, Pa., town and county-seat of Pike County, on the Delaware River, and seven miles from the Erie Railroad, about 45 miles east of Scranton and seven miles southwest of Port Jervis. It is situated in a portion of the Delaware Valley noted for its beautiful and picturesque scenery. The Sawkill Falls and the Cliffs are in the vicinity, and on the northwest and south of the town are mountains. Three miles south are the falls of the Raymonds Kill and 21 miles south are the cataracts of Big and Little Bushkill creeks. Milford is one of the pre-Revolutionary places, but it was not made a separate township until 1832. The town of Milford was laid out in 1796. It is a favorite resort for hunting and fishing parties. Many of the legends and stories connected with the place may be found in ‹Pike County Folks,› by E. H. Mott. Pop. about 900. In summer the population is over 6,000.

MILFORD, Wales, a seaport town of Pembrokeshire on the celebrated Milford Haven, one of the safest, deepest and most capacious harbors in Britain, forming a deep indentation in the southwest coast of the county. The haven stretches about 10 miles from east to west, with a breadth of from one to two miles, and branches off into numerous bays, creeks and reaches. The largest vessels can enter and put to sea in any wind or at any tide more expeditiously than from almost any other large harbor in Great Britain, and it has long been proposed to make Milford the eastern seat of the transatlantic trade, as bringing London nearer by several hours. The haven is defended by fortifications. Henry II embarked at Milford Haven in 1172 on his way to the conquest of Ireland, and here Richmond landed (1485) in his successful effort to dethrone Richard III. The town of Milford on the north shore, eight miles northwest of Pembroke and six miles from the mouth of the haven, has extensive modern docks and a busy agricultural and domestic trade with Irish ports. It is the seat of a United States consular agent. Pop. of urban district, 6,399.

MILFORD, Engagements at. Milford, Va., on the east bank of the south branch of the Shenandoah, was the scene of several skirmishes and three cavalry engagements during the Civil War. On 24 June 1862 detachments of the First Maine and First Michigan cavalry attacked about 300 mounted Confederate infantry at the place, without decisive result, and withdrew. When Sheridan, after the battle of the Opequon (q.v.), followed Early up the valley, he ordered General Torbert, commanding the cavalry, up the Luray Valley, to get past Early's right and cut off his retreat. Wilson's division advanced and 21 Sept. 1864 attacked Wickham's cavalry division of two brigades and drove it from Front Royal and up the valley to Milford, where Wickham took up a strong defensive position on the south side of Milford Creek, one flank on the Shenandoah and the other on a knob of the Blue Ridge. When Torbert came up on the 22d he concluded that the position was too strong to be attacked, and not knowing that Sheridan had attacked Fisher's Hill (q.v.) fell back to near McCoy's Ferry, again advancing, and on the 23d occupying Milford, which had been abandoned by Wickham. Sheridan was greatly disappointed by Torbert's failure to carry the place on the 22d. After the battle of Cedar Creek (q.v.), 19 Oct. 1864, Milford was occupied by Lomax's Confederate cavalry division, and its defenses strengthened. On 24 October Powell's cavalry division, two brigades of about 1,100 men, with six guns, moved up the Luray Valley to reconnoitre. Powell skirmished with Lomax's outposts on the 25th, and on the morning of the 26th attacked Lomax in position at Milford, using his artillery freely, and continuing the contest until 2 P.M., when, finding the defense so stubborn and the position too strong to be carried, he withdrew.

MILFORD HAVEN, Louis Alexander, Marquis of. See BATTENBERG, LOUIS ALEXANDER.

MILFORT, Le Clerc, lĕ klãrk mĕl-fŏr, or mĭl'fõrt, French adventurer: b. Mezières, France, about 1750; d. there, 1817. He came to America, traveled through the colonies and about 1776 visited the Creek Indian nation. Here he attached himself to the Creek chieftain, Alexander McGillivray, whose sister he married. He was made a war chief by the Indians, was called Tastanegy, or «great warrior,» and was in active service against the Whigs of Georgia during the Revolution. He remained with the Creeks for 20 years. In 1796 he returned to France and was made a general of brigade by Bonaparte. He wrote, or perhaps merely furnished material for, the interesting ‹Mémoires, en Coup-d'œil Rapide, sur mes Voyages dans la Louisane, et mon Sejour dans la Nation Creeke› (1802).

MILHAUD, Gaston, French author and philosopher: b. Nîmes, 1858. He was professor of philosophy at the University of Montpellier in 1894–1910, and has since been professor of the history of philosophy at the Sorbonne, Paris. Author of ‹Leçons sur les origines de la science grecque› (1893); ‹Num Cartesii methodus tantum valet in suo opere illustrando quantum senserit› (1894); ‹Les philosophes geomètres de la Grèce, Platon et ses predecesseurs› (1900); ‹Le hasard chez Aristole et chez Cournot› (1902); ‹Cournot et le pragmatisme scientifique contemporain› (1911), etc.

MILIARIA (MILIARY FEVER, MILLET-SEED RASH, PRICKLY HEAT), a very common fine papular or papulovesicular eruption. It is caused by too profuse sweating attended by undue congestion of the skin. Hot weather, excessive clothing, vigorous exercise, alcoholic dissipation commonly evoke the disease, especially in those who are debilitated or who have a delicate skin. It may appear and disappear rapidly without any apparent cause. Its appearance is attended by pricking, burning or itching sensations. It is generally limited to a portion of the trunk, but may appear upon the face, neck and extremities. Fresh crops may follow one another. In subsiding the vesicles become opaque and yellowish white.

MILICZ, mē'lĭch, or **MILITZ, Johann,** Moravian reformer: b. Kremsir, Moravia, about 1325; d. Avignon, France, 29 June 1374. He entered the Roman Catholic priesthood in 1350 and in 1360 became canon at the cathedral of Saint Vitus in Prague and was appointed secretary to Charles IV, who took him to Germany. Becoming convinced of the hollowness of court and Church life, in 1363 he resigned and began to preach to the lower classes in Prague in their own tongue, instead of the Latin, and gained over them a wide influence. Convinced that Antichrist had arrived and that the day for reform was at hand, he went to Rome that he might consult the Pope and was arrested by the Inquisition, but was released and was well received by Urban V. Upon his return to Prague he resumed his preaching, but in 1372 he was accused of heresy by his brother priests and summoned to Avignon for trial. He proved his innocence, but died before the verdict was rendered. Consult Palacky, ‹Die Vorläufer des Hussitenthums› (1869).

MILITARISM, term applied to the policy of giving to military training and exploits disproportionate prominence in a nation's affairs and the resulting subordination of civil authority; or the maintenance of a government by military force. The term is used chiefly in connection with the vast armaments maintained by European countries; and has come in particular to mean the preparation, as in the case of Germany prior to the launching of the European War, of a vast force maintained not for purposes of national defense but for those of imposing at pleasure the will of the powerful nation upon those weaker and less well armed. It carries in its train the extremist theories of war as a necessity to the proper development of a nation's material and spiritual welfare.

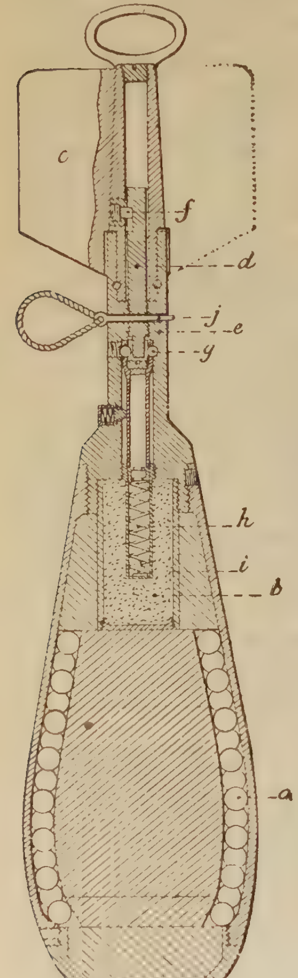
MILITARY. See ARMY; UNITED STATES, ARMY OF THE.

MILITARY ACADEMY, Royal, an institution at Woolwich, England, where candidates for the Royal Engineers and the Royal Artillery of the British army receive their finishing education. See MILITARY EDUCATION.

MILITARY ACADEMY, United States. See UNITED STATES MILITARY ACADEMY.

MILITARY AERONAUTICS. Ever since the early days of aeronautics, with the development of the old spherical balloon, the use of aircraft in time of war has been a fruitful theme for discussion. Lighter-than-air craft has figured prominently in warfare. The French used a military balloon at the battle of Fleurus on 26 June 1794 and from that date for over a century, until after the South African War, the aerial machines employed for purposes of observation were either captive in the form of balloons attached to winches, or in the guise of man-lifting kites or they perforce drifted at the will of the winds that blew. In the Franco-Prussian War, during the siege of Paris alone, as many as 66 balloons left the stricken city, carrying 60 pilots, 102 passengers, 409 carrier pigeons, 9 tons of letters and telegrams and 6 dogs. Gaston Tissandier went over the German lines and dropped 10,000 copies of a proclamation addressed to the soldiers, asking for peace, yet declaring that France would fight to the bitter end. In the American Civil War an aeronaut named La Fontaine went up in a balloon over an enemy camp, made his observation, rose higher into the air and succeeded in getting into a cross-current, which carried him back to his place of departure. The first cross-channel flight was made by balloon in 1785, by Blanchard, who had with him an American doctor named Jefferies, together with a large supply of provisions, ballast and oars. With the development of dirigible balloons in the closing years of the 19th century and the advent of the areoplane a few years later the spherical type of balloon fell into disfavor as an auxiliary in war, although it was used with some success by the French in the colonial campaigns and also on the western front during the World War of 1914–18. In the article AERONAUTICS (q.v.) are described the development, construction, advantages and limitations of the several types of aircraft — the spherical balloon, kite balloon, dirigible, nonrigid, semi and rigid types and the aeroplane. In this article it is only intended to point out the development of special military types and their adaptability to the several tasks for which they were designed.

Uses.— Briefly, there are five main uses for aircraft in war. The first and widest is for reconnaissance. The second is for co-operation with artillery to locate the enemy's batteries and determine accuracy of fire. The third is as instruments of offense in encounters in mid-air, either by classes of bombs, quick-firing guns or the use of other arms to destroy the pilots or machines of the enemy and therefore to prevent his achieving any of his aerial purposes as well as to cause him loss of personnel and equipment. The fourth is bombardment either of moving military objectives, like transports and so forth, or of stationary objects, such as airdromes, camps and the like; or, contrary to international law as defined by The Hague Convention, to drop missiles on unfortified areas and on buildings such as hospitals, cathedrals, churches and the like. The fifth use is for convoying vessels such as troopships, merchantmen and even warships, by reason of the much wider range of vision possible from an altitude, whereby the approach of any enemy craft on the surface of the water can be detected at a much greater distance and whereby in normal atmospheric conditions and on certain surfaces it is possible to detect the approach of submarines and the presence of mines. The types of aircraft adapted to these five main uses are:



THE MARTEN HALE AEROPLANE BOMB (longitudinal section).

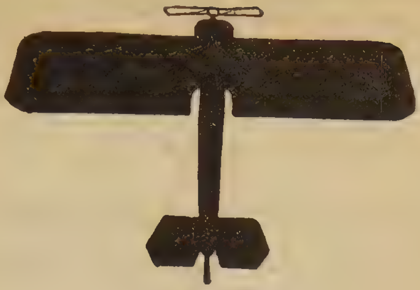
The lower part contains 340 steel bullets and an explosive charge of 4.41 pounds of trinitrotoluol. The upper or neck portion carries two small wings (*c*), a handle and a safety-pin (*J*). In throwing the bomb the safety-pin *J* is withdrawn and the handle released. The air-pressure during the fall causes the wings (*c*) to turn and in so doing they unscrew the stem *d* until it is stopped by the shoulder *f*. The two balls *g* are then free, and the detonator when the bomb lands, compresses the spring and strikes the needle *i*, which explodes the charge. Adjustment is so fine that the charge is exploded merely by dropping the bomb on a water surface.

The Captive Balloon.—Notwithstanding the supremacy of the aeroplane in most fields of aerial warfare, the captive balloon in military operations still has it advocates. The great advantage of the captive balloon is that the observer is constantly in direct telephonic communication with the artillery commanders in his vicinity, constant and thorough inspection of the enemy's positions with the aid of powerful glasses reveals every movement of bodies of troops or anything new that has developed during the previous night and the targets thus presented can be immediately taken under fire. Captive balloons are placed from two to four miles in the rear of the front line and are separated by intervals depending upon the artillery activity in various sectors. The altitude at which they are held depends upon atmospheric conditions and upon the activity and distance of the enemy's artillery. Captive balloons are usually sent up at daylight and remain in the air until dark, being drawn down whenever necessary to change observers. Occasionally they are left up at night and it is frequently found that enemy guns that are not visible by daylight may be located at night by their flashes. It is customary to have two officers in the car and they are connected with the ground by telephone. The great disadvantage of the captive balloon is the comparative ease with which it may be destroyed by a hostile aeroplane. The late war furnished instance after instance in which the observers in captive balloons were obliged to jump with a parachute on the approach of enemy aeroplanes, so certain had become the destruction of such balloons upon incendiary bullets being hurled into them from an aeroplane. Man-carrying kites have advantages and disadvantages similar to the captive balloon.

Free Balloons.— This type is now little used save as a means of communication from a beleaguered city or fortress. There being no means of steering such craft they are as likely to be wafted toward the enemy as toward their friends, as in the case of those liberated during the siege of Paris in 1870, many of which fell into the hands of the Prussians.

Military Dirigibles.— The military dirigible is used extensively for night scouting, bombing, and to some extent for transportation of military personnel. Hundreds of dirigible balloons, ranging in size from the small «Blimp,» about 180 feet long, to the huge Zeppelins, 700 feet long, were used in the late European War. The «Blimps» were used mostly for coast patrol and for convoying ships; the large dirigibles were used primarily for bombing. Three types of dirigibles are used: (1) the rigid; (2) the semi-rigid, and (3) the non-rigid. The rigid type of dirigible is one in which the shape of the gas compartments is maintained by means of rigid framework. The semi-rigid dirigible has a rigid longitudinal frame usually below the gas bag; this frame serves to distribute evenly the ascensional strains against the supported weights of engines, crew, etc., to prevent buckling of the gas bag which in most dirigibles of this class depends upon internal gas pressure to maintain the shape of the envelope. The non-rigid dirigibles depend entirely on gas pressure within the envelope to maintain shape, the nacelle, or body, being suspended by a net of longitudinal canvas bands sewed to the envelope. The chief advantage of the non-rigid type is that it can be transported deflated; its defect that a rent in the gas bag puts it out of commission. In France dirigibles are classed according to volume, which runs from 2,000 cubic metres for the *Vedette* class to over 10,000 cubic metres for the *cruiser* or *dreadnought* type. The latter is especially favored because of its greater range, speed and lifting power. These ships are equipped with rapid fire guns to repel attacks by hostile aircraft, with wireless equipment in order to communicate with its base. It is however as a bomb-

Clement — Bayard (French).



Bréguet (French).

Aviatik (German).

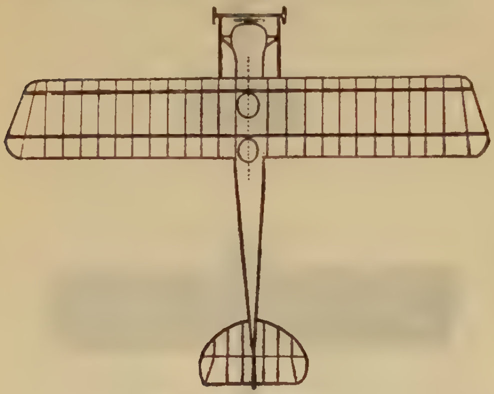
Deperdussin (French).

Albatross (German).

Fokker (German).

ing machine that these heavy machines find their best field. For reconnaissance purposes the aeroplane is superior. The bombing raids on London throughout the war show the possibilities of attack of the large dirigible type. With the development of anti-aircraft guns, dirigibles were obliged to keep at a greater height when dropping bombs and thus their accuracy of aim was greatly impaired. The verdict of most experts having in view the performances of dirigibles during the late war is that they have been a disappointment. They cannot be safely employed in daylight hours because of their vulnerability to hostile aeroplanes; their great cost as compared with aeroplanes — about 50 to 1 — is disproportionate when it is remembered that the aeroplanes can, with a greater margin of safety, perform similar functions. The problem for sheltering dirigibles is also a serious one.

Aeroplanes.— The Wright, Farman and Blériot machines (see AERONAUTICS) may be considered as the parent types from which has been evolved the large variety which at the present time are at the disposal of the military aviator. Among the various types which have sprung from the parent forms we search in vain for any underlying new principles. There is, however, in the various types plenty of variety of constructional detail. Perhaps the two most important features of modern military aeroplane work are (1) the gradual substitution of steel in place of wood, and the general strengthening of aeroplane construction; (2) the armoring of vital parts of aeroplanes for the exigencies of warfare. Regarding the various types of machines now available, it must suffice here to especially mention the features of special interest for the purpose of warlike operations. As the military operations in Europe developed it became apparent that the aeroplane was suitable for very many military purposes. It is from the air that artillery fire is regulated, after the airmen have reconnoitred and photographed the enemy's position, taken the plan of their trenches and discovered the importance and emplacements of their batteries. It is from the air that the arrival of reinforcements by rail or motor is signaled. By means of aerial bombardments attempts are made to cut, or at least disorganize, the enemy's communications. These attempts are made even on the base railway stations, and, further still, on the factories and powder and ammunition dumps. During the battle the aeroplane flies over the troops and regulates the lengthening of the fire as the assaulting force advances. Four years of war resulted in the subdividing of types and their relegation to various specific duties. Scouting is the first and widest use of the aeroplane in war. For this work fast monoplanes and biplanes have been developed into the strategical reconnaissance type, with a cruising radius of 500 miles, carrying pilot and observer with sketching outfit, aerial camera, wireless set and navigating instruments. The tactical-reconnaissance aeroplane has similar personnel, only the observer is trained in military tactics and transmits technical reports of enemy movements. The fire-control aeroplane is designed to give a particularly wide range of vision to the observer, who transmits the results of his observations by wireless. There are two classes of long-range bombers, the machine of excessive speed with pilot and bomber, and the multiple-engined machine, with heavy bomb load, great wing spread, pilot and two bomber-mechanics. The pursuit machine takes many forms — monoplane, biplane, triplane — one-place and two-place, highly powered and with minimum aerofoil to permit of the maximum of speed and manœuvrability. The one-place machines are equipped usually with automatic machine guns, firing above or through the propeller zone by means of a synchronizing device. The two-place machines are equipped with from two to five machine guns, several automatically fired by mechanisms thrown into mesh by the operator and others manually by the operator. In the course of the European War aerial strategy developed from the single machine reconnaissance of 1914 to the flying squadron formation, scouting, fighting and bombing groups, under wireless control from the ground, which were operating in 1918. See AERONAUTICS; AEROPLANE; AEROPLANE ENGINES; SIGNAL CORPS; STRATEGY; TACTICS; WAR, EUROPEAN.



Bristol Biplane (British).

Bibliography.— Abbott, Willis John, 'Aircraft and Submarines; the Story of the Invention, Development, and Present-day Uses of War''s Newest Weapons' (New York 1918); Ader, Clement, 'Avionnerie Militaire' (Paris 1918); Berry, W. H., 'Aircraft in War and Commerce' (New York 1918); Loening, Grover C., 'Military Aeroplanes' (Boston 1918); Woodhouse, Henry, 'Textbook of Military Aeronautics' (New York 1918); Collins, Francis A., 'The Air Man: His Conquests in Peace and War' (ib. 1917); Fales, Elisha N., 'Learning to Fly in the United States Army: 'A Manual of Aviation Practice' (ib. 1917); Gill, Napier J., 'The Flyer's Guide: An Elementary Handbook for Aviators' (London 1917); Müller, Hollis R., 'Manual of Military Aviation' (Menasha, Wis., 1917); Munday, Albert H., 'The Eyes of the Army and Navy' (New York 1917); Rolt-Wheeler, Francis W., 'The Wonder of War in the Air' (Boston 1917); Widmer, Emil Joseph, 'Military Observation Balloons (Captive and Free): A Complete Treatise on their Manufacture, Equipment, Inspection and Handling, with Special Instructions for the Training of a Field Balloon Company' (New York 1917); Winslow, Carl Dana, 'With the French Flying Corps' (ib. 1917); Woodhouse, Henry, 'Textbook of Naval Aeronautics' (ib. 1917); Ader, Clement, 'L'Aviation militaire' (10th ed. rev. et corr., Paris 1916); Bek, Roustam, 'Aerial Russia' (New York 1916); Crouvezier, Gustave, 'L'aviation pendant la guerre' (Paris 1916); Hearne, R. P., 'Zeppelins and Super-Zeppelins' (New York 1916); Lafon, Charles, 'Les armées aériennes modernes' (Paris 1916); Lanchester, Frederick W., 'Aircraft in Warfare' (London 1916); Robson, William A., 'Aircraft in War and Peace' (London 1916); United States Staff Corps — War College Division, 'Military Aviation' (Washintgon 1916). Consult also the *Aeronautical Journal* (London, quarterly, 1911 et seq.); and *Aviation and Aeronautical Engineering* (New York 1916 et seq.).

G. DOUGLAS WARDROP.

MILITARY ARCHITECTURE. Prehistoric.— During the primitive eras of man's development his structural interests were centred in the fulfilment of the demands of simple shelter for worship and protection. Safety from attack was attained by the erection of domiciles in inaccessible places or in rearing lake dwellings on wooden piles, as in Switzerland. Aggregations of houses were in very early times surrounded by walls of earth or stone erected for the purpose of fortification

Heroic Age.— Tiryns and Mycenæ furnish typical examples of the military architecture of the Heroic Age of Greece. At Tiryns the palace of the ruler, reared on an Acropolis, is surrounded by massive walls in which are passages covered by stones successively corbelled until they meet. The masonry is formed of colossal stones put together without cement. At Mycenæ there still exists the remains of a city gate of this period. The huge lintel of this gate is relieved of the superposed weight that the solid and very heavy wall would have brought to bear upon it, by a triangular opening which is filled with a most celebrated sculptured group representing two rampant lions flanking a column. This triangular opening presented the weakest spot in the whole length of the wall and was embellished with the sacred lion form to protect it from the assault of superstitious assailants.

Civilization gradually traced her way from the flat alluvial areas of Mesopotamia to the valley of the Nile. Reinforced with the elements of progress and power of Egypt, through the medium nations of Asia Minor and the Mediterranean, the laws of order and culture were transmitted to Greece. Greece, in her turn, taught imperial Rome the elements of universal government. As in the other arts, so in the problem of protecting her cities from the carefully planned destructive agency of man, the constructive experience of Egypt and the Orient was transmitted to succeeding civilizations. The first four links of the chain that binds the world together are the civilizations of Minoa, Mesopotamia and Egypt, Greece and Rome. Minoan protective art has been known to us by the remains at Cnossus, Mycenæ and Tiryns, and the primitive walls and embryonic projects at Orchomenos, Delos and Phigaleia.

Egypt.— In Egypt the early fortifications consisted of a quadrangular double wall of sun-dried brick approximately 15 inches thick and at times 50 feet in height. Square towers of the same height as the walls occurred at intervals. Both walls and towers were crowned with parapets. At times the entrance was additionally protected with outworks consisting of a second lower wall and towers. Frequently there was a keep or citadel used as a last resort for defenders. Lower Egypt was undoubtedly greatly influenced by the advanced systems of fortifications with which the Egyptians became acquainted during their wars against the Hittites in western Asia.

Hittite.— The culminating type of the Hittite military system was the double-moated city of Kadesh, of which we have a lively illustration in the battle scene from the great Kadesh reliefs of Rameses II on the walls of the Ramesseum. These carvings show the capital, Kadesh, situated on an island in the Orontes River. The city, protected by two moats, approached by two parallel draw-bridges, is encircled by a huge, high wall. The main gateways are strengthened by increasing, at the place of their occurrence, the thickness of the wall, heightening the towers and providing rooms for the housing of a special gate guard. The relief shows the city to have been built in the form of a circle or ellipse. (Consult plan of Chateau-Gaillard, France). The plan at once obviates the four danger points inherent in the rectangular city enceinte. The walls were surmounted by battlements and strengthened by auxiliary towers or buttresses, the top of which did not extend far above the main wall. At Senjirli extensive ruins of a fortified Hittite palace have been found. The entrance was planned as a fortress-like portico. Massive towers flanked the approaches. The guardroom, the ceiling of which was supported by columns, intervened between the moat and the gate. The city was divided into sections, each separated from the other by protecting walls. (Consult plan of Haidra, Africa). It is a notable fact that the ancient Hittite protective city plan finds its reproduction in more or less complete form in the great fortified cities and towns of mediæval Europe and Africa.

Mesopotamia.— The configuration of the land exposed the cities of Chaldæa, Assyria and Babylonia to easy attack, for the flat character of the territory made siege from four sides possible. Hence it is that military architecture, forced to meet the added hazards of the *locus,* received a mature study and development that had not occurred elsewhere in the pre-classic world. It was in Asia that the early developments of the art of war construction, which subsequently formed the basis of the Roman, Visigothic and Mediæval science, was through necessity established. Numerous ruins serve to show us the character of the Chaldæo-Assyrian protective scheme. Typical of every phase of this art was the city of Dur-Sharrukin, the modern Khorsabad and site of the palace Sargon. The ancient city was surrounded by a wall 150 feet wide and 60 feet high, furnished with battlements, towers and outworks, and entered by means of arched gateways flanked by protecting towers. The palace of the ruler stood upon a stupendous platform constructed straddling the northwest wall. The position of the palace gave to it the maximum amount of protection from within and from without the city.

Greece.— Early Greece was settled by wandering tribes. Tribal equality ceased when unusual strength established local domination on the part of a family or a tribe that had waxed powerful. This condition forced, for protection, a union of local interests — through the establishment of these confederations the Greek city came into existence. Religion and daily life were indissolubly connected in Greece, and the acropolis or upper city of the Hellenes was graced with the monuments erected in honor of the beneficent gods who were everywhere the guardians of the city and society. In the Orient the protected heights that the Greeks reserved for their shrines were preempted by the luxury-loving despots as the safest place for their court buildings and palaces. Athens, with its Acropolis crowned by the noble Parthenon, was the sacred centre of the Attic life, and upon its safety was lavished the thought and ingenuity of the military experts of the time. Its capture and sack by the Persians forced a reconstruction of all of its defenses. Under Themistocles, the Athenian leader, the entire city was surrounded by a strong wall and the Piræus, the port of Athens, was fortified and its harbors protected by moles. Subsequently the city and port were joined by long walls, thus making it possible to control the Attic lands as well as her maritime interests. These extensive military constructions embody everything that the Greeks thought would be of value to them, with which they had come in contact through the widespread medium of the Delian League. The knowledge thus gained was later absorbed by Magna Græcia and Sicily.

Rome.— The Romans exhibited an extraordinary genius for organization and adaptation. The site of a Roman city was usually selected on territory sloping toward a river. If the area chosen were terminated by another embankment sloping in the opposite direction, a perfect site, from the Roman point of view, was available. The city with its walls flanked on one side by the river was approached by a bridge, the end of which on the bank opposite the city was defended by a tete-de-pont. Within the walled area or enceinte a castle was constructed which commanded the whole system of defense and provided a final refuge for the garrison. If the walls failed, the side of the town opposite the river, on account of the escarpment, was difficult of access and the protecting wall on this side was comparatively easy to defend. The walls connecting the river walls and the escarpment walls presented the weakest parts of the fortifications. It was therefore necessary additionally to protect the towers and walls in this position with ditches. In order that the defenders might harass the flank of besiegers, the gates were flanked with towers that projected well out from the walls. The Romans took care not to surround a hill with a wall. Their principle was to carry a defense wall across the summit of the elevations of any city site. The typical example of the Roman system, as carried out on a great scale, is the city of Rome herself. The Romans, according to Vezetius, found that the enclosure of a fortified place ought not to be in one continuous line, for the reason that battering rams would thus be able too easily to effect a breeching; whereas, by the use of towers placed sufficiently close to one another in the rampart, greater safety would be provided. In erecting the walls for their fortifications of cities, the Romans built two strong walls of masonry separated by an interval of 20 feet, which interval was filled with the spoil from the extramural trenches. This fill formed the base for a parapet walk. The Roman military camp, curiously enough, has exerted a tremendous influence upon civil architecture. This is because the Emperor Diocletian, upon his abdication, laid out at Spalato, in Dalmatia, a great palace based upon the plan of the military camp. The carefully cut masonry walls enclosed a rectangular space. Four gates gave access to the palace city, one in the centre of each of the walls. Two intersecting avenues connected these entrances. In the usual camp, the quarters for officers and soldiers were built of brick or wood. The general-in-chief was provided with elaborately protected quarters adjacent the Prætorian or principal gate. In the Castra, palace of Diocletian, quarters for servants and for the guards were constructed. At Mousmieh, the ruins of the Prætorium or Guard-house, with its curious handling of constructive detail, established an architectural type which exerted notable influence on later work.

Byzantium.—The ancient Greek city, Byzantium, was built on a site that was strategically excellent, surrounded, as it was, by water on three sides and protected from the ravages of the barbarians by a wall on the north side. The traditions relating to the construction of the walls cover all the discoveries and technique of the various ages of Greek and early Roman civilization. The Byzantine walls of mediæval Constantinople consist of three distinct sections: that on the west toward landward side; secondly, that on the Golden Horn; and third, that on the Marmora or the seaward side. The Byzantine city was completely enclosed by these wall sections. In the design of all of the Byzantine fortification construction, æsthetic possibilities have been suppressed and completely subordinated to the requirements of defense. The widespread influence of Constantinople carried the spirit of the Byzantine science of military engineering throughout Mesopotamia, Asia-Minor, northern Africa and southern Spain. At Granada, in Spain, the hill dominating the city was crowned with the strongly-fortified palace of the ruler. The enclosure was surrounded by a strongly-built wall, reinforced by great defensive towers that served to render the palace, in its day, practically impregnable.

Middle Ages.—The traditions of Rome, with here and there modifications due to Byzantine influence, determined the arrangement of the defenses of the fortified towns and castles of the Middle Ages. The cities were often protected by several walls; at other times the city proper was located upon the highest available ground and surrounded by heavy walls. Its suburbs were outposts, furnished with protective towers and curtain walls. From the 3d to the 11th centuries the Roman defensive system underwent but little modification. The most notable existing example of this period is the reconstructed Visigothic city of Carcassonne. This was a frontier city of the greatest importance. During the 13th century the Visigothic enceinte was thoroughly repaired and the celebrated Tresan tower and Narbonnaise gate on the eastern side were erected. The castle is the most carefully defended work of the period and the precautions taken to ensure its safety arouse the admiration of all who study its intricate arrangement of moats, ramparts and barbicans, or advance fortified towers. Ragusa, on the eastern shores of the Adriatic, and Haidra, Africa, serve to visualize for us the massive picturesque security that made these cities practically unconquerable previous to the use of artillery. In Italy the great feudal lords, commanding lofty sites in the neighborhood of cities, erected secure fortresses. During the first half of the 12th century, due to the intolerable depredations of the half-savage nobles, the various cities of northern Italy overcame and dispossessed the majority of the feudal chieftains and forced them to come into the cities. The great residences that they built were provided with high and strongly-fortified towers. These constructions made it possible for the nobles to defy the municipal restrictions and set at naught the conventions of the city. The famous leaning towers of Bologna, the Asinelli and Garisenda (12th century) are among the very few remaining examples of the Italian defensive towns of the Middle Ages.

Castles.—The castles serving as a refuge for a town garrison differed in general plan from the castles of the isolated nobles, which aimed to procure the security that was so well obtained in the Chateau-Gaillard, built by Richard Cœur-de-Lion in the Andelys. Selecting a place where a sharp bend in the Seine formed a strategically strong peninsula, and this peninsula being made secure, on a lofty promontory on the opposite bank the major fortress was built. To the south a tongue of rock, less than 15 feet in width, served to connect the isolated promontory with the adjacent hills. This was the only attackable point of the fortress. To protect this vulnerable point a strong tower flanked by subordinate ones and curtain walls was built and so commanded the plateau. This outwork was separated from the enceinte of the castle by a deep ditch excavated in the rock. The body of the place consisted of two parts, the lower court, and, separated from this by a moat, the internal castle, with its elliptical enceinte. The strength of the defense culminates in the keep or donjon. The donjon was to the castle what the castle was to the fortified towns — its last retreat, and upon it therefore was lavished the utmost care.

Artillery — Modern.— Toward the middle of the 15th century artillery had attained a great development. As a result of this progress the problems of attack and defense were wholly changed. In attack, how strangely modern reads this excerpt from the ‹Past and Future of Artillery,› by L. Napoleon Bonaparte, Vol. II.: «Instead of erecting bastiles all round the town, the besiegers established before the great fortresses a park surrounded by an intrenchment, beyond the reach of cannon. From this point they conducted one or two branches of the trenches towards the point where they established their batteries. . . . We have arrived at the moment when trenches were employed as a means of approach concurrently with covered ways of timber.» It was obligatory, in view of the new agencies of war, to replace the picturesque high, machicolated towers and battlemented walls of feudalism with low breastworks on an extended line. The persistency of tradition, however, caused the retention in numerous places of feudal forms until well in the 17th century.

The following formula, developed by Viollet-le-Duc, epitomizes the necessities of the problems that determined the character of the transition to new and modern military architecture: «To command the outside parts at a distance and the approaches by horizontal fire of artillery, and to provide against escalade by works of a great elevation with crest-works, according to the ancient system for close defense.»

The castle of Bonaguil (Charles VII) is one of the very few military structures that have been preserved that was designed to fulfill the spirit of the formula just enunciated. The requirements of present-day defensive civic architecture are based upon the fundamentals that appear in the planning of the castle of Bonaguil and shape the fabric of the numerous modern armory buildings designed for the housing and training of the military safeguard of the nation. Typical examples of the modern adaptation of the newer principles of military architecture, where the necessities of protecting military stores of arms and ammunition from mob and riot assault require the masses and parts of the fabric to be so disposed that the attacking force may be seen while the defenders are hidden from sight, and a possibility of obtaining a cross and defile fire may be provided at all vulnerable portions of the structure, are to be found in the armories of the 8th Coast Artillery and the 15th Infantry, New York City.

Bibliography.— Consult Britton, ‹Architectural Antiquities,› Vol. III (London 1807–26); Clark, ‹Mediæval Military Architecture› (London 1884); id., ‹Fortification› (London 1907); Enlart, ‹Manuel d'archéologie française› (Paris 1904); Harvey, ‹The Castles and Walled Towns of England› (London 1911); McGibbon and Ross, ‹Castellated and Domestic Architecture of Scotland from the Twelfth to the Eighteenth Century› (Edinburgh 1887–97); Rey, ‹Étude sur les monuments de l'architecture militaire des croisés en Syrie› (Paris 1871); Thompson, ‹Military Architecture in England› (London 1912); Viollet-le-Duc, ‹Dictionnaire raisonné de l'architecture française du XIe au XVIe siècle› (10 vols., Paris 1876). LEWIS F. PILCHER,
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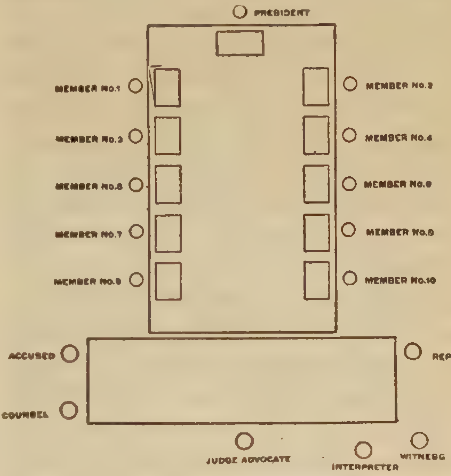
MILITARY BRIDGES. See BRIDGE; MILITARY ENGINEERING.

MILITARY COMMISSION. See LAW, MILITARY.

MILITARY COURTS-MARTIAL. For each general or special court-martial the authority appointing the court appoints a judge-advocate, and for each general court-martial one or more assistant judge-advocates when necessary. The judge-advocate prosecutes in the name of the United States and under the direction of the court prepares the record of its proceedings. In conjunction with the president of the court, he authenticates the record by his signature and, at the end of the trial, transmits the same to the reviewing authority. Should the accused, for any reason, not be represented by counsel, the judge-advocate from time to time throughout the proceedings advises him of his legal rights. During the trial he sees that the accused has full opportunity to interpose such pleas and make such defense as may best bring out the facts, the merits or the extenuating circumstances of his case. In so far as such action may be taken without prejudice to the rights of the accused, any advice given him by the judge-advocate should be given or repeated in open court and noted upon the record. The judge-advocate is not challengeable; but in case of personal interest in the trial or of personal hostility toward the accused he should apply to the convening authority to be relieved. Throughout the trial the judge-advocate should do his utmost to present the whole truth of the matter in question and should oppose every attempt to suppress facts or to distort them, to the end that the evidence may so exhibit the case that the court may render impartial justice. The accused has the right to be represented before a general or special court-martial by counsel of his own selection, for his defense, if such counsel be reasonably available. This counsel performs such duties as usually



devolve upon the counsel for a defendant before civil courts in criminal cases.

General courts-martial have power to try any *person* subject to military law, for any *crime* or *offense* made punishable by the Articles of War. In addition they have power to try any person other than above, who by the law is subject to trial by military tribunals, for any *crime* or *offense* in violation of the law of war. Punishment upon conviction is discretionary with a general court-martial, except when mandatory under the law, or when limited by order of the President under the Articles of War; in addition, the death penalty can be imposed only when specifically authorized. The death penalty is mandatory in the case of spies; dismissal is mandatory for conduct unbecoming an officer and gentleman; either death or imprisonment for life is mandatory for murder and rape; punishment is mandatory in part and discretionary in part for false muster, false returns, officer drunk on duty in time of war and personal interest in the sale of provisions. The usual punishments imposed upon soldiers are the following, beginning with the least severe: Detention of pay, forfeiture of pay, reduction, hard labor without confinement, confinement at hard labor and dishonorable discharge. In the absence of evidence of two or more previous convictions, a minor offense, the nature of which appears to demand punishment by hard labor, should ordinarily be punished by hard labor without confinement, rather than by confinement at hard labor. For offenses properly punishable by detention of pay, forfeiture of pay, reduction or hard labor without confinement, those forms of punishment should, as a rule, be resorted to before confinement at hard labor is imposed. Many punishments formerly sanctioned have now, under a more enlightened spirit of penology, become so obsolete as to be effectually prohibited by custom without the necessity of regulations. Punishment by flogging, or by branding, marking or tattooing on the body is prohibited under the Articles of War; and no person can, by general court-martial be convicted of an offense for which the death penalty is made mandatory by law, nor sentenced to suffer death, except by the concurrence of two-thirds of the members of said court-martial and for an offense in the Articles of War expressly made punishable by death. No sentence of a court-martial can be carried into execution until the same shall have been approved by the officer appointing the court or by the officer commanding for the time being. Any sentence of death requires confirmation by the President before the sentence of a court-martial can be carried into execution, except in the cases of persons convicted in time of war of murder, rape, mutiny, desertion or as spies, and in such excepted cases a sentence of death may be carried into execution upon confirmation of the commanding general of the army in the field or by the commanding general of the territorial department or division.

An officer charged with crime or with a serious offense under the Articles of War is placed in arrest by the commanding officer, and in exceptional cases an officer so charged may be placed in confinement by the same authority. A *soldier* charged with crime or with a serious offense under the Articles of War is placed in confinement, and when charged with a minor offense he may be placed in arrest. *Any other person* subject to military law charged with crime or with a serious offense under the Articles of War is placed in confinement or in arrest, as circumstances may require; and when charged with a minor offense such person may be placed in arrest. Any person placed in arrest is restricted to his barracks, quarters or tent, unless such limits are enlarged by proper authority. An officer is placed in arrest by his commanding officer in person or through another officer, by a verbal or written order or communication, advising him that he is placed in arrest, or will consider himself in arrest, or words to that effect. An officer in arrest cannot exercise command of any kind. He cannot wear a sword nor visit officially his commanding or superior officer, unless directed to do so. His applications and requests of every nature are made in writing. Officers are not placed in arrest for light offenses. For these the censure of the commanding officer generally answers the purpose of discipline. In ordinary cases where inconvenience to the service would result from it, a medical officer is not placed in arrest until the court-martial for his trial convenes. Except as provided in the Articles of War, or when restraint is necessary, no soldier is confined without the order of an officer, who previously inquires into his offense; it is proper, however, for a company commander to delegate to commissioned officers of his company the power to place enlisted men in arrest as a means of restraint at the instant when restraint is necessary, but such action must at once be reported to the company commander. Non-commissioned officers are not confined in company with privates if it can be avoided. When placed in arrest, they are not required to perform any duty in which they may be called upon to exercise authority or control over others, and when placed in confinement, they are not sent out to work. When the sentence of a general court-martial prescribes dishonorable discharge and confinement, so much of the sentence as relates to confinement is expressed in substantially the following form: *To be confined at hard labor at such place as the reviewing authority may direct for* ——— (leaving to the reviewing authority the designation of the place of confinement). A military post, station or camp is designated as the place of confinement of any general prisoner whose confinement is directed to be in a penitentiary or disciplinary barracks. The arrest of an officer has been compared to an enlargement on bail, the security being the officer's commission. It is for this reason that the punishment for breach of arrest may include dismissal. The distinction between arrest and confinement lies in the difference between the kind of restraint imposed. In arrest the restraint is moral, imposed by the orders fixing the limit of the arrest, or by the terms of the Article of War. The intention or motive that actuates a breach of arrest is immaterial to the question of guilt, though, of course, proof of inadvertence or bona-fide mistake is admissible in guiding the court in fixing punishment.

The present system of courts-martial leads to injustice logically, naturally and inevitably, and needs corrective modification. It is an inheritance from the old British code, which was adopted in 1774 and never changed. Instead of being a court in the proper sense, it is simply the executive arm of a commanding officer. When the accused is arrested and brought before this tribunal he generally has no counsel skilled in the law and (when convicted) is convicted by a court which has no knowledge of law. The sentence is reviewed by an authority sometimes equally ignorant of law and the man is forced to undergo the sentence imposed. An illustrative case, from the records of trials by courts-martial, is that of a man who was arrested and charged with desertion. He was sentenced to forfeit all pay, be dishonorably discharged and serve ninety-nine (99) years at hard labor. The reviewing authority in sustaining the court naïvely remarked that it would not enforce the part of the judgment providing for the man's dishonorable discharge until he had served his prison sentence.

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MILITARY EDUCATION. The foundation of all military education is the school, ranging from the school of the soldier or grenadier to the school of the battalion. Recent wars have demonstrated that it is necessary to organize schools for specialists and schools for command where officers and men of all grades can be instructed in the essential principles of modern war and in the proper employment of different military means and engines. By these schools the complete harmony between the different arms and between the commander and his troops can be secured. The organization of all military instruction must provide for instruction in the essential principles of war and the combination in combat of the different arms employed, and the condition of permanence and of continuity is necessary in all such instruction if the best possible results are to be obtained. As practised in the schools of Europe (patterned largely after the United States Military Academy) the instruction of troops gives them indispensable intellectual training and information on the procedure in battle and assists the officers in obtaining from them their best efforts. The instruction of specialists employs such methods as give the men full confidence in their army and weapon, a confidence based upon results obtained by employing it under the conditions of battle. The schools which correspond most nearly to the United States Military Academy are the Military Schools of Italy, the École Militaire de Belgique, or Military Academy at Ixelles, the Theresa Military Academy of Wiener-Neustadt, the Technical Military Academy of Vienna, the Royal Military Academy at Woolwich, the Royal Military College at Sandhurst, the École Polytechnique at Paris, the École Speciale Militaire at Saint Cyr and the Upper Cadet School of Gros-Lichterfelde.

The military schools of Italy are divided into three classes, viz.: (1) The Collegi Militari, or military preparatory schools of which there are five, established at Naples, Florence, Milan, Rome and Messina. (2) The military schools for the training of officers and non-commissioned officers, known as the Military School of Modena, the Military Academy of Tunis, the Military Sanitary School of Application in Florence and the Non-Commissioned Officers' School in Caserta. (3) The military schools of application proper, for officers, known as the War School (Scuola di Guerra), in Turin; the School of Application of Artillery and the Engineers, in Turin; and the School of Cavalry, in Pinerola. There are, in addition to the foregoing, schools for artillery and musketry practice, a school of fencing, and batteries and platoons of instruction for training non-commissioned officers.

The *École Militaire,* or Military Academy, at Ixelles, supplies officers to the infantry, cavalry, artillery and engineers. The length of the course of instruction is two years for the infantry and cavalry section, and four years for the artillery and engineer section. All students, on commencing the second year's course, contract to serve for eight years, and there are no admissions to the school except by competition. The Minister of War decides upon the persons who are to be admitted to the military academy, in accordance with the results of the competitions.

The *Theresa Military Academy* of Wiener-Neustadt educates officers for the infantry, rifles and cavalry; the *Technical Military Academy* of Vienna educates officers for the artillery, engineers and technical troops (including the railway and telegraph troops). The different kinds of places at these military academies are *Ararial* (imperial or treasury) places, wholly or half free; *Stiftungs* (foundation or endowment) places; and paying places. These different kinds of places are at the disposal of the Imperial War Ministry or the ministries of national defense of Austria and Hungary. The places for which there are endowment of private funds are disposed of in accordance with the stipulations of the letter of donation. The *Ararial* places were formerly given directly by the emperor. In awarding these places preference is given to the sons of officers, and then to the sons of officials. The *Stiftungs* places are disposed of by competitive examination, the persons who are allowed to compete being designated by the state, country or other authorities.

The *Royal Military Academy* is maintained for the purpose of affording a special military education to candidates for commissions in the royal artillery and royal engineers. Candidates must, in the opinion of the commander-in-chief (who is the president of the Royal Military Academy), be in all respects suitable to hold commissions in the army. An independent inspection is made annually by a board of visitors, appointed by the Secretary of State for War, and reporting to him. Such visitors are not a permanent body, but are not all changed at the same time. The report of this board is presented to Parliament. The academy is under the control of a military officer, styled governor and commandant, appointed by and responsible to the Secretary of State for War, through the commander-in-chief. The governor is assisted by a staff officer styled the assistant commandant and secretary, who is responsible in his temporary absence for the charge of the establishment. This officer commands the cadet company, and has the custody of the records and correspondence of the academy and gives the governor such assistance as he may require. The governor is assisted in the arrangement of the studies by a board composed of the assistant commandant and the professors or senior instructors of the different branches. The head of each branch has the supervision and inspection of the studies in his department and reports on them to the governor. Admission to the Royal Military Academy as cadets is granted to the successful candidates at an open competitive examination.

The *Royal Military College* at Sandhurst is maintained for the purpose of affording a special military education to candidates for commissions in the infantry and cavalry. Candidates must, in the opinion of the commander-in-chief, be in all respects suitable to hold commissions in the army. The commander-in-chief is president of the Royal Military College, and, as at the Royal Military Academy, there is an annual independent inspection and a governor and commandant in control, assisted by an assistant commandant and secretary, who commands the cadet battalion and has the custody of the records and correspondence of the college. Admission to the Royal Military College is granted to successful candidates at a competitive examination and to Indian Cadets, pages of honor and others subject to a qualifying examination. The characteristic features of the Woolwich and Sandhurst schools are the brief period of instruction and the somewhat exacting competitive standards for admission. The two occupy to a considerable extent the relation of cause and effect, with some diversity of judgment expressed as to their expediency.

The *Polytechnic School,* or L'École Polytechnique, at Paris, was founded in 1794 and has been reorganized by various decrees. The object of the school is to train students for the following branches of the public service: The artillery of the army and the marine artillery; the engineer corps of the army; the engineer corps of the navy or naval constructors; the corps of naval officers; the hydrographic corps; the marine commissariat corps; the corps of highways and bridges; the manufactories of the state; the engineers of the powder and saltpetre service; the mining engineers and the telegraphic lines; also for such other public services as require a profound knowledge of the mathematical, physical and chemical sciences. Admittance to the school is exclusively by competitive examination. After a two years' course the student may go to one of the special schools of application for any of the above mentioned services, provided he can pass successfully the final examinations and declared to be acceptable for this service by the decision of a committee which draws up the classification list for the public services. Fulfilment of these conditions does not give an absolute right to enter any of the public services; admission to any service depends upon the number of vacancies existing at the time of leaving the school, upon the physical aptitude of the student and his place on the order of merit. The school is directly subject to the Minister of War.

The *Special Military School of Saint Cyr,* or Saint Cyr, as it is popularly designated, dates from the time of Louis XIV, and is intended to supply officers for the infantry, the cavalry and the marine infantry. The course of instruction lasts two years, and no scholar is allowed to remain more than three years at the school. The privilege of taking a third year to complete the course is only allowed where circumstances of exceptional gravity have compelled a student to suspend work at the school. Admittance to the school is exclusively by competitive examination and competitors are limited to those who have obtained certain degrees, or a certificate of qualification for the baccalaureate degree in secondary or classical modern schools. In France the system adopted in the armies at the front is that of centralizing the instruction in each army. This instruction embraces: (1) Schools of the line — (a) course for captains which prepares for the command of the battalion, (b) special course for commanders of division depots, (c) course for company commanders, (d) course for non-commissioned officers, (e) practical course in engineering; (2) schools of specialists — (a) school for grenadiers, (b) machine-gun schools, (c) automatic rifle school, (d) school for the 37 mm. gun, and (e) school of liaison and signalling. These schools are generally in a zone about two or three days' march from the front. In addition to these schools, practical instruction is given in the division depots to recruits who have just joined combat organizations. Behind the front are instruction battalions formed from recruits of the youngest classes, and in the interior of the country are vast camps where schools of specialists carry on their training.

In Germany, the school which corresponds most nearly to the United States Military Academy is the *Upper Cadet School,* at Gross-Lichterfelde (Haupt-Katetten-Austalt). This school is fed or supplied by the «Kadettenhausen,» or preparatory cadet schools. Saxony and Bavaria have their own cadet corps corresponding to the preparatory and upper cadet schools of Prussia, from which appointments are made to the Saxon army corps and to the corps of the Bavarian army. Saxony, however, has no artillery and engineer school, and officers of those arms have to pass through the Prussian School at Berlin. Bavaria has its own artillery and engineer school at Munich.

The military educational system of the United States comprises:

1. The Military Academy at West Point for the education of cadets.
2. Post schools for the instruction of enlisted men.
3. At each military post a garrison school for the instruction of officers in subjects pertaining to the performance of their ordinary duties.
4. Service schools. See ARMY SERVICE SCHOOLS.
5. The military department of civil institutions at which officers of the army are detailed under the provisions of law. The detail of these officers at these institutions is announced and the regulations governing the courses of instruction therein are issued from the War Department.

War Department orders prescribing regulations to govern post and garrison schools lay down specifically the course to be followed in the more elementary schools for officers and enlisted men. Brigade commanders devote special attention to the post-graduate scheme of instruction, which runs through the entire period of garrison training. The post-graduate course of instruction includes such map problems, terrain exercises, tactical or staff walks or rides, or other work pertaining to the local terrain as brigade commanders may prescribe; this portion of the course may be made to amplify the work of the elementary schools for officers and enlisted men, as well as the drill and practical instruction preparatory to field training.

See NAVAL EDUCATION and UNITED STATES MILITARY ACADEMY.

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Consulting Military and Civil Engineer.

MILITARY ENGINEERING. Military engineering is officially stated to be that branch of engineering science applied by engineer troops in the field to the emergencies of modern warfare in order to protect and assist troops, to ameliorate the conditions under which they are serving, to facilitate locomotion and communication and whenever the occasion requires to act as purely combatant troops. In the performance of these duties engineers are trained and equipped to supplement or amplify by scientific measures the efforts of combatant troops in the services mentioned below and such other special services of an engineering nature as may arise and are beyond the technical training of combatant troops, or such as require the use of engineering implements and material not supplied to combatant troops. The following services are executed under the supervision of engineer officers by engineer troops, by details from other troops, by civilian labor or by any combination of these means as the particular circumstances may require:

1. The service of reconnaissance, including tactical reconnaissance, engineering reconnaissance, surveying, mapping and sketching, panoramic sketching, photography, drafting and map reproduction.

2. The service of castramentation, including the selection, laying out and preparation of camps, the reconnaissance and municipal and sanitary engineering incident thereto, and the installation, operation and maintenance of water-supply systems.

3. The service of fortifications, pertaining both to the attack and the defense and including the selection of defensive positions when not in the presence of the enemy; rectification of and assistance in the selection of such positions in the presence of the enemy; the location, design and construction of the more important field works; assistance in and supervision of the construction of hasty defenses wherever possible; the supply of tools and materials, and the reconnaissance, demolitions, water supply and communications incident thereto.

4. The service of sieges, pertaining both to the attack and defense and including the selection and location of defensive lines, lines of investment and siege works, the construction of saps, mines and counter-mines; the operation of searchlights; preparation for and assistance in attacks, counter-attacks and sorties; organization of captured points, and the supply of tools and materials.

5. The service of demolitions, including the carrying out of all work of this nature authorized by the commander and not within the scope of other troops.

6. The service of battlefield illumination, including the supply and operation of searchlights and other means of battlefield illumination.

7. The service of general construction, including the location, design and construction of wharves, piers, landings, storehouses, hospitals and other structures of general utility in the theatre of operation.

8. The service of communications, including the construction, maintenance and repair of roads, ferries, bridges and incidental structures; the selection and preparation of forts; the construction, maintenance and operation of railways under military control and the construction and operation of armored trains.

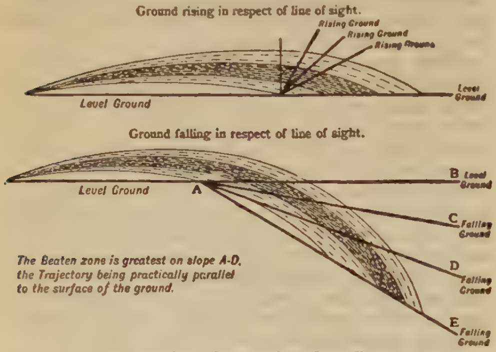
9. Special services, including all municipal, sanitary and other public work of an engineering nature which may be required in territory under military control.

Fire Action.— To comprehend the subject of fortifications it is imperatively necessary to know and understand the effect of fire both from small arms and artillery, destructive forces quite different in action from those against which the engineer must ordinarily protect his works. To shoot straight, to direct a projectile true to its target, is a feat of engineering just as much as the accurate adjustment and pointing of a theodolite in a geodetic survey. Rifle fire which dominates a certain space and prevents the enemy from occupying it is just as effective as that which strikes his men, and the greater the space which can thus be occupied by fire action per unit volume of fire the more efficient is that fire. Artillery fire has of late become a most important factor in modern tactics with its great increase and accuracy and bids fair almost to revolutionize battle tactics and the art of fortification. By the application of *indirect fire* and spotting a battery can take up a position of safety and systematically search out the landscape.

Fortifications.— Fortifications may be defined as any engineering devices for increasing the fighting power of troops in the field. Entrenchments, screens or blinds, obstacles, communicating trenches, mines and demolitions, all come under the designation of fortifications. Of these the most important are those which afford protection from the enemy's fire and incidentally provide concealment and means of intercommunication. The term fortification, as commonly employed, refers to works of this character only. Field works are usually considered as to (1) location, or siting; (2) trace, or ground plan; (3) construction; (4) concealment. Engineers generally make three distinct classes of field or temporary fortifications: (1) all works devised for the temporary protection of important points, such as cities, arsenals, bridges, fords, positions, etc., technically known as *field works;* (2) the various devices of the engineer for reducing a fortified place by means of parallels and approaches, known as *siege works;* (3) quickly made defenses by which an army in the presence of an enemy protects itself, known as *battle entrenchments* or *hasty entrenchments.*

The general line to be held or defended depends upon strategical considerations and the location of trenches is affected by the general line to be occupied, tactical considerations and features of the terrain. Tactical considerations, such as actual or potential interference by the enemy with the construction, may affect the location. All works for the defense of a position should provide concealment, a clear field of frontal fire, good communications to the rear, the flanks resting upon some natural obstacle or in contact with adjacent troops. A clear field of fire to the front was formerly considered all important and necessary to be secured at the expense of all other considerations; but, with the greatly increased effectiveness of modern artillery, it has been accepted as a maxim that, *that which is seen is as good as destroyed,* and concealment of the works becomes of first importance.

Organization of a Position.— The organization of a position does not imply the establishment of a continuous firing trench. The terrain in front of a position is best covered by a combination of frontal and flank fire from distinct elements, such as trenches, blockhouses, etc., separated by small intervals; thus economizing the personnel which is one of the advantages of fortification, and minimizing the effect of the enemy's artillery fire. Each of these elements is occupied by a fixed garrison, which should always be a complete unit, the strength of which, variable according to circumstances, may be as much as a platoon. These elements are not uniformly distributed along the front; their distribution is determined by the features of the terrain, the necessity of having a greater volume of fire at one point than at another, in one direction than another, and other tactical considerations. A line can always be forced at some points so that it is necessary to have elements in rear which come into action when the first have fallen. It is, therefore, necessary to disperse the elements laterally and in depth. A group of elements, thus disposed, is known as a *strong point,* and by their mutual support should permit the garrison to hold and stop the enemy by its fire. It should be surrounded by a continuous obstacle and should always be occupied by a fixed unit responsible for its defense. Strong points are grouped together laterally and in depth to form *supporting points* and the combination of several supporting points under one commander forms a *sector.* This organization is a gradual development made during a prolonged occupation of a position in trench warfare such as developed on the western front in Europe. In the initial occupation of a position the first step is the construction of the strong points for the firing line, with their firing trenches and obstacles first, then their cover, approach and communicating trenches. The next step is the construction of the strong points for the support trenches, with the necessary communicating and approach trenches. Finally the defensive zone is completed by the construction of the reserve and intermediate trenches organized into strong points, and all of these into supporting points and sectors.

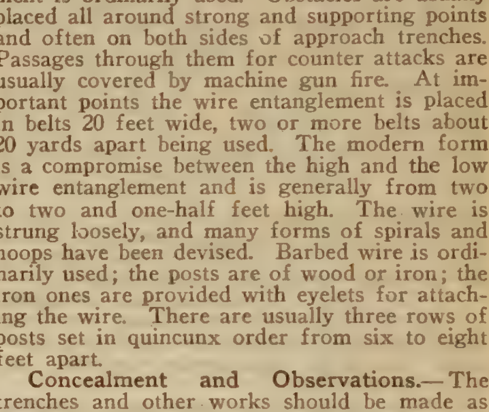

Ground rising in respect of line of sight.

Ground falling in respect of line of sight.

The relation of ground to fire effect.

Obstacles.— The object of an obstacle is to check a hostile rush and delay the enemy under the close fire of the defense, and it should be at such distance from the parapet that it is difficult for hostile bombers to crawl up to it and throw bombs into the trench. On the other hand, the obstacle should be under close observation and fire of the defense. If possible it should be concealed for purposes of surprise and to decrease its liability to injury by artillery fire; it should form no shelter for the enemy. Some form of wire entanglement is ordinarily used. Obstacles are usually placed all around strong and supporting points and often on both sides of approach trenches. Passages through them for counter attacks are usually covered by machine gun fire. At important points the wire entanglement is placed in belts 20 feet wide, two or more belts about 20 yards apart being used. The modern form is a compromise between the high and the low wire entanglement and is generally from two to two and one-half feet high. The wire is strung loosely, and many forms of spirals and hoops have been devised. Barbed wire is ordinarily used; the posts are of wood or iron; the iron ones are provided with eyelets for attaching the wire. There are usually three rows of posts set in quincunx order from six to eight feet apart.

Concealment and Observations.— The trenches and other works should be made as nearly invisible as possible, and their concealment should be completed by treating the front slope of the parapet so that its appearance from the front and from aircraft will correspond to that of the surrounding ground. Crops should be replaced where disturbed, and carefully arranged; bushes should be planted to hide the parapet, the men on watch, riflemen and observers. Sod should be preserved and placed on the parapet and parados. Dummy trenches and works should be freely employed



Portion of a company trench designed for a squad.

so as to deceive the enemy as to the strength of the defender and to scatter his fire. The observation of the enemy is of first importance in position warfare. It should give complete knowledge of all elements of the hostile line and prompt information of any movement of the enemy. It is effected by observation from the ground and from aircraft. Observation from the ground is divided into three echelons: (a) In front of the firing line from small posts and listening posts. (b) On the firing line by sentinels and lookouts. (c) In rear of the firing line, by artillery observers, sentinels and lookouts of the shelters. Observations on the firing line are effected by lookout posts organized preferably at the salients where the view is more extended. They are provided with periscopes, range finders and large scale maps. The location of the lookout posts and observatories must be determined in accordance with a complete plan for each supporting point or sector of defense. In position warfare, careful and studied attention must be given to illumination on the battle field, lines of information, depots for material and ammunition, the employment of machine guns, trench weapons, command posts, first-aid stations, kitchens, latrines, lavatories, shower baths, water supply, maintenance, protection against asphyxiating gas and protection against bombs and grenades. When circumstances render night work necessary, special dispositions must be made.

Mining.— Underground communications are classed according to their directions as galleries, which are horizontal or nearly so, and shafts, which are vertical or nearly so. Galleries are classified according to their size as great or grand galleries, which are six feet high by seven feet wide; common galleries six feet by three and one-half; half galleries, four and one-half feet by three feet; branches, three and one-half feet by two and one-half feet; and small branches, two and one-half feet by two. Shafts may be drill holes or wells, or may range in size from the smallest in which a man can work, say three feet by three feet, to any size which may be required, seldom more than 6 feet by 10 feet. If troops or guns are to be passed through galleries, they must be made large enough for that purpose. Grand and common galleries usually meet these requirements. The primary requisites of subterraneous excavations are accuracy of direction, prevention of caving, ventilation, drainage and lighting. Picks and shovels for mining are similar in form to standard tools, but are smaller and have shorter handles. A special tool called the push pick is very convenient in soft earth. In large galleries a transit may be used, and in smaller ones a plane table or prismatic compass. The box compass cannot be sighted and read with sufficient accuracy for this work.

The transfer of the azimuth underground depends on whether the gallery starts from a shaft from a reverse slope, or, if not very deep, from a level with a descending branch. In the second and third cases, which will be the rule in military mining, the azimuth may be established in the gallery by a transit or compass used in the ordinary way. In the case of a shaft, which will be the exception, the azimuth must be established across the top or mouth and transferred to the bottom by means of plumb lines. Prevention of caving is accomplished by linings. In very firm soil it is sometimes practicable to drive small shafts and galleries short distances without lining them. Galleries constructed during a siege are lined with wood. Wooden linings are of two general types, known as cases, and frames and sheeting.

In sinking shafts especial care must be taken to make the excavation no larger than is required for placing the lining. Partly lined shafts should only be used for small depths and when they are expected to stand for a very short time. They are a constant menace to the miners, owing to the danger of their caving in, and in a much greater degree to the probability of stones, etc., falling from the unprotected parts and seriously injuring or killing the men at the bottom. In changing direction horizontally with frames and sheeting, if the soil will stand for a distance of one frame interval or even less, it is only necessary to place one or more frames at an angle until the necessary change is secured. The sheeting on the outside is placed by running the forward end past the frame and then inserting the rear end behind the last bay of sheeting. When the earth shows a tendency to cave, which it will frequently do in great galleries, the cap sill must be put in position and supported while the miner excavates the grooves for the ground sill and stanchions, for which purpose two crutches are used.

In military mining and especially in gallery work careful attention must be given ventilation and drainage. A pressure-blower, worked by hand or power, is among the essential items of a mining equipment. If water shows itself or is suspected, dead-level galleries must be avoided, and all slopes should fall toward a point or points where the water can be disposed of.

A satisfactory explosive for the purposes of military engineering must be: (1) Stable as to its constitution and characteristics for a long period. (2) Unaffected by ordinary variations of temperature and moisture. (3) Insensible to shock of handling, transportation, projectiles and neighboring explosions. (4) Not too difficult of detonation. (5) Quick enough to give good results when not confined and slow enough to give good results when confined. (6) Convenient in form and consistency for packing and loading and for making up charges of different weight. These conditions point to a high explosive of medium strength of granular or plastic consistency, put up in waterproof cylindrical cartridges of standard size and length. The detonating compound in general use is fulminate of mercury, and all methods of firing involve the explosion of a small quantity of fulminate enclosed in a cap or fuse and placed in the charge. Bickford or safety fuse is used to ignite the fulminate when electricity is not available. This fuse may be used in wet holes, but for underwater use it should have a continuous rubber coating; when a total blast is divided into a number of charges it is important that all should go at the same instant. In simultaneous ignitions by electricity, the fuses are connected in series: that is to say, they are all placed in the same circuit. A lead from the firing apparatus is connected to one wire of a fuse on one flank. The other wire of this fuse is connected to a wire of the next fuse, and so on, until the last fuse is reached, the second wire of which is connected back by a lead to the firing point. It may be assumed as sufficiently exact that charges of the same explosive develop total energies directly proportional to their weights. This energy is exerted in all directions in compression of the surrounding medium. The distance at which this disturbance remains sufficient to destroy galleries is called the radius of rupture and the surface joining the ends of these radii is called the surface of rupture. The relief of pressure on one side shortens all radii of rupture which have a component in that direction, but does not appreciably affect those which have no such component. Hence, when material is displaced the surface of rupture is ellipsoidal; when no material is displaced it is spherical. Land mines are usually formed by excavating from the surface and are designed to be exploded at the moment the enemy is over them. They are usually employed in front of defensive positions and in connection with visible obstacles. The charges are placed deep enough only to avoid artillery projectiles. If no artillery fire is to be expected they may be placed just under the surface. If a bore hole is sufficient the charge is placed at the bottom and the hole well tamped. If an open pit is dug the mine chamber should be in firm ground at one side and the hole back-filled and well rammed.

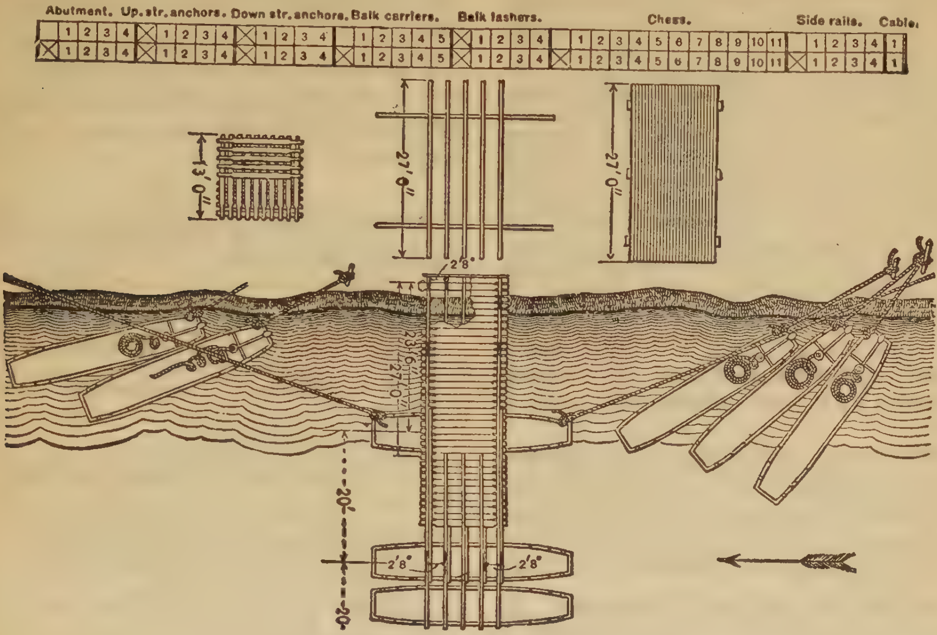
In siege operations mining is done at close quarters, and is, or should be, opposed by countermining by the enemy. There is then a double purpose in view; to reach the original objective by placing the charge where intended and firing it, and while so doing to detect and circumvent any attempt of the enemy to interfere, or to prosecute any enterprise of his own.

Demolitions.— Military demolitions have for their purpose to destroy or make unserviceable any object in the theatre of war the preservation of which would be unfavorable to the army or favorable to the enemy, excepting always objects neutralized by international convention or the laws of war. Demolition is permissible only under a military necessity. They may be made by fire, by mechanical means or by explosives. Fire is the only agent when absolute destruction is necessary, as in case of food supplies, munitions of war, structural materials, etc. Soluble matter, as gunpowder, sugar, salt, etc., might be destroyed in water, but this method is laborious. Burning is equally effective and much easier. For quick results with slow-burning materials a quantity of highly combustible stuff must be collected. In the destruction of railroads, operations may be directed against rolling stock, bridges, culverts, tunnels, track or accessories, such as water stations, telegraphs, etc. Locomotives are temporarily disabled by removing valves or other small vital parts; permanently, by building a fire in a dry boiler or by detonating a charge of explosive in the boiler. In haste, piston or connecting rods, links, etc., may be destroyed by explosives, or a hole may be blown in the bottom of the tender tank. Cars may be burned or wrecked by collisions or derailment. The best places are in deep cuts or tunnels. Wooden bridges may be burned or small ones may be pried off their seats by levers or dragged off with tackle. Track may be destroyed by taking it up, burning the ties, heating the rails on the fires and twisting them with bars through the bolt holes, with a chain and lever, or a hook and lever. Telegraph lines are temporarily disabled by breaks, in which the wires are cut, grounds in which the wires are connected to the ground and crossed in which a metallic connection is made between the wires. A ground may be made by connecting a wire to the rail or to a bar or plate of metal in damp earth. Copper is best. To destroy a telegraph line cut down and burn poles, cut and tangle wires and break insulators. To disable guns, smash the sights and firing gear; endeavor to dent or burn the corners of the breech-closing wedge and damage the elevating gear. Unscrew the striker plug and take it out: fire one or two rifle bullets into the opening. The degree of success attained in demolitions with explosives depends upon the experience of the powder men doing the work. The explosive adopted for the United States service is triton (trinitrotoluene, trinitrotoluol, trotyl, TNT). It may often become necessary to use whatever explosive is at hand; for this reason data for their use is given. There are many uncertainties attending the military use of explosives, and local conditions frequently raise a doubt as to the efficiency of the application of formulated methods. Where a lifting effect is desired, gunpowder should be used: but, when a cutting or shattering effect is necessary, a high explosive is better, such as triton, dynamite, gun cotton, etc. Each company of engineers carries on each of its two tool wagons a demolition outfit and supplies, consisting of earth and wood augers, pinch bars, magneto exploders, sledge hammers, picks, shovels, firing wire, caps, fuses, etc., and 200 pounds of explosive. In addition it has two pack demolition outfits, each with demolition tools and supplies, including 45 pounds of explosive. Each squadron of cavalry has a pack demolition outfit with demolition equipment and supplies, including 80 pounds of explosive.

Bridges and Pontons.— When an army has to cross a stream, passage may be made on a bridge, by fording, by use of boats, rafts or ferries, or on ice. Tactical requirements will determine the general location of the point of crossing, and within the limits imposed by these requirements the site of crossing must be selected and the method adopted that is best suited to the site. The site is selected as a result of reconnaissance to verify and complete the information shown by existing maps. To meet tactical requirements the near shore in an advance should afford concealment for the preparatory work in connection with the bridge, and should, if possible, facilitate a converging fire upon the enemy, while the farther shore should be open to favor development. The reconnaissance should furnish information as to the liability of freshets and their probable height, the rise and fall in tidal streams, the width and depth of the stream, the presence or absence of navigation, the nature of existing facilities such as roads or fords and the presence of bridge material such as timber, rope or wire. Where possible, the approaches should be straight and in line with the bridge.

Military bridges are divided primarily into floating and fixed. The types of floating bridges most commonly used are the ponton bridge, built with the equipage carried with the army, and bridges built with boats or barges. Types less frequently used are the bridges built with casks, rafts, timber, inflated skins and other means in the nature of bridging expedients. The fixed bridges best adapted to military use are pile, trestle, spar and suspension bridges. Other types that may be used are cribwork, steel girder, trussed and cantilever bridges. Some of the loads (in pounds per linear foot) to which military bridges may be subjected are as follows:

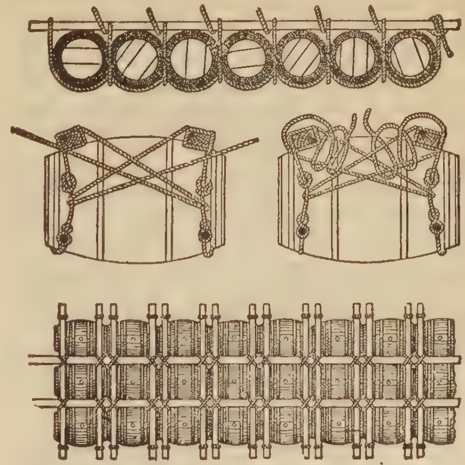
Infantry, single file	140
Infantry, column of twos	280
Infantry, column of fours	560
Cavalry, single file	196
Cavalry, column of twos	392



Floating bridge by successive bays.

In the absence of bridges a ferry may be operated by stretching a cable across the river and pulling the boat by hand along the cable. Another method is to use a long rope fastened to a point up stream, either on the bank or to an island or anchor in midstream, and navigate the boat back and forth by utilizing the force of the current acting obliquely on the boat. This is called a flying ferry. The wooden ponton will carry 40 infantrymen armed and fully equipped, in addition to the crew, under favorable conditions. If a stream has high banks, with trees or other means available as anchorages, it may be practicable to stretch a rope across and transport men and materials in chairs, baskets or slings suspended from the rope.

Fords may be used by small bodies of troops without bridge equipage, but they are unreliable crossings and are generally unsatisfactory for large bodies. If the current is moderate a depth of three and one-half feet may be passed by infantry and four and one-half feet by cavalry. Artillery and wagons can cross water three feet deep and keep dry. The bottom should be even, hard and tenacious. A ford may be rendered impassable by a freshet or by the deepening resulting from the loss of material stirred up and carried away during the passage of troops. A ford may be destroyed by filling the deepest part with harrows, teeth up, or with planks filled with spikes, with barbed wire or other obstructions.


Barrel Piers, rafts and bridges.

Benefiting by the experience of the European armies, the United States has greatly increased the proportion of engineer troops. A recent order gives the following units for each field army, in addition to the divisional engineer troops: One regiment, gas and flame; 1 regiment, mining; 1 regiment, water supply; 1 regiment, general construction; 1 regiment, engineer supplies (1 battalion transport, 1 battalion skilled labor, 1 service battalion to aid in this work); 1 battalion, mapping and printing; 4 battalions transport service (6 service battalions to aid in this work, 6 truck trains of 31 trucks each, 5 wagon trains of 61 wagons each). Assigned to the line of communications and constituting an independent group, each field army has the following engineer troops: One regiment, general construction (6 service battalions to aid in this work); 1 regiment, engineer supplies (3 service battalions to aid in this work); 10 battalions forestry (9 service battalions to aid in this work); 1 regiment, quarrying (3 service battalions to aid in this work). The European War was one of engineers, and upon the efficient leadership of engineer troops depended in large measure the ultimate success of the Allies.

Edward S. Farrow,
Consulting Military and Civil Engineer.

MILITARY FRONTIER. See Frontier.

MILITARY GOVERNMENT. See Government.

MILITARY HONORS, salutes and other marks of deference paid to army and navy officers, government officials and certain other distinguished individuals. See Orders and Decorations of Honor; Salutes, Military.

MILITARY HOSPITALS. See Hospitals, Military.

MILITARY INSIGNIA OF RANK. Insignia of rank are worn to-day in all armies to distinguish the various grades of officers and non-commissioned officers. It is usually in the form of epaulets, straps, braid, buttons or chevrons, and is worn on the shoulder, sleeve or collar of the uniform coat, according to the custom of the country to which the soldier belongs.

Military uniform did not come into existence until after the Thirty Years' War, the household troops of Louis XIV of France being the first to wear it. Badges of rank were not in general use in the different armies until the latter part of the 18th century, although some regiments had adopted distinctive devices for this purpose long before that time.

In all armies the insignia of rank are such as is prescribed by the government, and all officers and soldiers are forbidden to wear any insignia except such as that to which their rank entitles them. The form of the insignia is always the same for officers or non-commissioned officers of the same rank, but its color sometimes differs according to the arm of the service to which the wearer belongs.

The various badges of rank worn to-day in the principal armies of the world are as follows:

United States.

In the United States army there are three recognized uniforms known as full dress, dress and service. Officers attending social functions of a military nature are permitted to wear a special full-dress uniform of a cut similar to civilian evening dress.

The full-dress coat for officers is dark blue and double-breasted, the dress coat is dark blue and single-breasted having concealed buttons, the service coat is single-breasted and of an olive drab color. The coats of all enlisted men are single-breasted, dark blue for full dress and dress and olive drab for service. Officers wear their insignia of rank on the sleeves of their full-dress and special full-dress coats, and on the shoulders of their dress and service coats. With the dress coat the distinctive insignia forms a part of the shoulder strap, the field of which differs in color according to the arm of the service to which the wearer belongs; on the service coat the device is attached directly to the shoulder loop which is of the same material as the coat.

Sleeve Insignia.

Major-General.— Two silver stars placed above a band of gold embroidered oak leaves which encircle the cuff.

Brigadier-General.— One silver star placed as above.

Colonel.— Five strands of gold wire lace arranged in the form of a knot extending from the cuff to just below the elbow.

Lieutenant-Colonel.— Four strands.

Major.— Three strands.

Captain.— Two strands.

First Lieutenant.— One strand.

Second Lieutenant.— Without gold lace.

Shoulder Insignia.

Major-General.— Two silver stars.

Brigadier-General.— One silver star.

Colonel.— One silver eagle.

Lieutenant-Colonel.— One silver leaf.

Major.— One gold leaf.

Captain.— Two silver bars.

First Lieutenant.— One silver bar.

Second Lieutenant.— One gold bar with a blank field with dress uniform, no insignia with service uniform.

Officers of the United States army wear the letters «U. S.» on the collars of their dress and service coats; officers of the United States Volunteers the letters «U. S. V.»; officers of the National Guard the initial letters of their respective States, unless when in national service when «N. G.» is superposed on «U. S.» National army officers wear «N. A.» over «U. S.,» Reserve officers «U. S. R.»

Each branch of the service and each staff department has a distinctive color with which the uniforms of the members of that portion of the army are faced.

The following are the colors of the different facings:

Staff Corps.— Dark blue.

Engineers.— Scarlet piped with white.

Signal Corps.— Orange piped with white.

Ordnance Department.— Black piped with scarlet.

Medical Corps.— Maroon.

Quartermaster Corps.— Buff.

Cavalry.— Yellow.

Artillery.— Scarlet.

Infantry.— Light blue.

The rank of non-commissioned officers is indicated by means of chevrons, of the color of the arm of the service to which the soldier belongs, worn point upward midway between the elbow and the shoulder on the sleeves of all uniform coats.

Sergeants wear three stripes, corporals two and lance corporals one. In addition to his stripes, a regimental sergeant-major has an arc of three bars, a battalion sergeant-major an arc of two bars, a battalion quartermaster-sergeant a tie of two bars, a first sergeant a lozenge and a company quartermaster-sergeant a tie of one bar. Non-commissioned officers of the different departments wear the distinctive devices of their departments with their chevrons.

Rank of non-commissioned officers is further indicated by the width of the trouser stripes, sergeants wearing a one and one-quarter-inch stripe, corporals a one-half-inch stripe.

To indicate service in war all enlisted men who have seen such service are entitled to wear on the sleeves of their dress coat a diagonal half chevron of white cloth, piped on each side with the facing of the arm of the service in which they earned the right to wear the chevron.

CONFEDERATE STATES.

During the Civil War the rank of officers and non-commissioned officers of the Confederate army was indicated in the following manner, the insignia being displayed upon the uniform coat, which for officers and enlisted men was double breasted and of a cadet gray color.

Rank of officers was designated by an ornament of gold braid worn on both sleeves of the coat extending around the seam of the cuff and up the outside of the arm to the bend of the elbow. The ornament was composed of four braids for general officers, three for field officers, two for captains and one for lieutenants. Besides this sleeve decoration, the rank of officers was further shown by devices worn on the collar of the tunic as follows:

General Officers.—A wreath with three stars enclosed, embroidered in gold.

Colonel.— Three gold stars arranged horizontally.

Lieutenant-Colonel.— Two gold stars.

Major.— One gold star.

Captain.— Three gold bars arranged horizontally.

First Lieutenant.— Two gold bars.

Second Lieutenant.— One gold bar.

Rank of non-commissioned officers was indicated by chevrons worn on both sleeves of the coat above the elbow, point downward, of the color of the facing of the arm of the service to which the wearer belonged.

Sergeant-Major.— Three bars and an arc in silk.

Quartermaster-Sergeant.— Three bars and a tie in silk.

Ordnance-Sergeant.— Three bars and a star in silk.

First Sergeant.— Three bars and a lozenge in worsted.

Sergeant.— Three bars in worsted.

Corporal.— Two bars in worsted.

The coats of both the officers and of the enlisted men were piped with a facing of the color of the arm of the service to which they belonged, the facings being as follows:

General Officers, Adjutant-General's Department, Quartermaster-General's Department, Commissary-General's Department and Engineers.— Buff.

Medical Department.— Black.

Artillery.— Red.

Cavalry.— Yellow.

Infantry.— Light blue.

GREAT BRITAIN.

Insignia of rank in the British army is worn on the sleeves and overcoat shoulders by officers, and on the right sleeve of the coat by enlisted men.

The rank badges of the officers, which are of embroidery, and which are attached to the shoulder pieces of the coat, are as follows:

Field-Marshal.— Crossed batons on a wreath of laurel, with a crown above.

General.— Crossed sword and baton, with star and crown above.

Lieutenant-General.— Crossed sword and baton, with crown above.

Major-General.— Crossed sword and baton, with star above.

Brigadier-General.— Crossed sword and baton.

Colonel.— Crown and two stars below.

Lieutenant-Colonel.— Crown and one star below.

Major.— Crown.

Captain.— Three stars.

Lieutenant.— Two stars.

Second Lieutenant.— One star.

Prior to May 1902, a captain wore two stars, a lieutenant one star and a second lieutenant had no badge of rank.

Regimental officers having brevet rank wear the badges of their army rank, department officers having honorary rank the badges of that rank.

The rank of non-commissioned officers is indicated by means of a chevron, worn point downward, on the sleeve of the coat above the elbow. A sergeant wears three stripes of gold braid, a lance sergeant three stripes of worsted, a corporal two stripes of worsted and a lance corporal one stripe of worsted.

GERMANY.

Insignia of rank in the German army is worn on the shoulders by officers and on the collar by non-commissioned officers.

Prior to 1808 there were no recognized badges of rank in the Prussian army, although Bavaria had already adopted them to some extent. During that year a system of rank badges was devised for the officers of the Prussian army which were worn on the shoulder pieces of the coat. During the campaign of 1813–14 these shoulder pieces were converted into epaulets and the insignia of rank was transferred to them, and the epaulet has ever since remained the distinctive mark of the officer. The German army in 1914 was composed of 22 army corps named after the different kingdoms which composed the empire. Each kingdom had some distinctive mark which was worn only by its troops; the insignia of rank however was the same throughout the army without regard to corps or arm of service.

Except in the case of a general field-marshal, the rank of officers is indicated by means of stars worn on the shoulder knots or epaulets.

Officers below the grade of major wear shoulder knots or scale-like epaulets, all other officers fringed epaulets. Shoulder knots are formed of half moon shaped pieces of gold or silver embroidery (according to the regiment) enclosing a cloth field of the color of the army corps to which the regiment belongs. On the field is displayed the regimental number and the insignia of rank. Epaulets for officers below the grade of major-general are of the same design as that of the shoulder knot with the addition of gold or silver fringe, according to the embroidery of the knot.

The epaulets of general officers are of silver bullion.

Insignia of rank for officers is as follows:

General Field-Marshal.— Two gold crossed batons.

Colonel-General.— Three gold stars.

General of Infantry or Cavalry.— Two gold stars.

Lieutenant-General.— One gold star.

Major-General.— Blank epaulet.

Colonel.— Two gold stars.

Lieutenant-Colonel.— One gold star.

Major.— Blank field.

Captain.— Two gold stars.

Field Lieutenant.— One gold star.

Second Lieutenant.— Blank field.

Non-commissioned officers wear the insignia of their rank on the standing collar of their coat, the different grades being distinguished in the following manner:

Lance Corporal.—Two small buttons of gold or silver (according to regiment) worn, one on each side of the collar directly above the shoulder.

Corporal.— A stripe of gold or silver lace extending around the top of the collar.

Sergeant.— The same collar stripe as that of a corporal with the addition of two large buttons worn on either side of the collar in the same manner as the buttons of a lance corporal.

FRANCE.

In the French army, insignia of rank is worn on the sleeves of the uniform coat by both officers and enlisted men. For officers it consists of stripes of gold or silver braid, according to the arm of the service, worn either straight across the sleeve directly above the cuff, or arranged in the form of a loop extending from the cuff to a point midway between the elbow and the shoulders. For enlisted men it consists of stripes of red or yellow cloth, or gold or silver braid, worn diagonally across the sleeve of the coat above the cuff.

Officers of infantry, engineers, spahis and of the Garde Republican wear straight gold stripes; officers of cuirassiers, dragoons, chasseurs a cheval, hussars, chasseurs d'Afrique, zephirs, and of the gendarmie, straight silver stripes, officers of zouaves, turcos and artillery, looped gold stripes.

Corporals of infantry, zouaves, cuirassiers, dragoons, chasseurs a cheval, hussars, artillery and engineers wear red stripes; corporals of turcos, chasseurs a pied, zephirs, chasseurs d'Afrique and spahis, yellow stripes.

The distinctive insignia of the various grades is as follows:

General of Division.— Six stripes of black mohair braid arranged in the form of a pointed loop, and two silver stars on epaulets.

General of Brigade.— Six stripes of black mohair braid arranged as for a general of division, and one silver star.

Colonel.— Five stripes of gold or silver braid.

Lieutenant-Colonel.— Three stripes of gold and two of silver, or three of silver and two of gold.

Major.— Four gold or silver stripes.

Captain.— Three gold or silver stripes.

Lieutenant.— Two gold or silver stripes.

Sous Lieutenant.— One gold or silver stripe.

Sergeant-Major.— Two gold or silver diagonal stripes.

Sergeant.— One gold or silver diagonal stripe.

Corporal.— Two red or yellow diagonal stripes.

Adjutants rank between officers and non-commissioned officers, a grade corresponding to that of a warrant officer of the United States navy. They wear practically the same uniform as that of a sous lieutenant, but their stripe is of the opposite color from that of the officers of their regiment.

Insignia of rank is also worn on the cap by officers, the cap being braided to conform with the sleeve decoration. When in full dress, officers wear epaulets of gold or silver according to the arm of the service to which they belong.

AUSTRIA-HUNGARY.

In the Austrian army, the insignia of rank is worn on the standing collar of the coat by both officers and enlisted men. Officers below the grade of major and all non-commissioned officers wear the badges of their rank upon a field of cloth, of the color of their regimental facing, extending from the front of the collar to the line of the shoulder piece; all other officers wear their badges of rank upon a field of gold.

The following is the distinctive insignia of the different grades:

Commander-in-Chief.—Gold collar embroidered with oak leaves.

Marshal.— Three gold stars.

Field-Marshal.— Two gold stars.

Major-General.— One gold star.

Colonel.— Three silver stars.

Lieutenant-Colonel.— Two silver stars.

Major.— One silver star.

Captain.— Three gold stars.

First Lieutenant.— Two gold stars.

Second Lieutenant.— One gold star.

Sergeant.— Three worsted stars, and a yellow stripe extending around the front and lower side of the collar field.

Lance Sergeant.— Three worsted stars.

Corporal.— Two worsted stars.

Lance Corporal.— One worsted star.

ITALY.

In the Italian army the insignia of rank, except in the case of general officers, is worn on the sleeve of the coat. The design, which is that of a loop, extends from the cuff to the elbow.

General officers wear one, two or three stars on shoulder straps of bullion according to rank. Sleeve insignia is as follows:

Colonel.— One wide and three narrow stripes of gold braid. Three stars on shoulder straps with gold lace edging.

Lieutenant-Colonel.— One wide and two narrow stripes of gold braid. Two stars.

Major.— One wide and one narrow stripe of gold braid. One star.

Captain.— Three narrow stripes of gold braid.

First Lieutenant.— Two narrow stripes of gold braid. Three stars on plain shoulder strap.

Second Lieutenant.— One narrow stripe of gold braid. One star.

Sergeant.— One red stripe with one gold stripe underneath.

Corporal.— One red stripe.

SPAIN.

The insignia of rank in the Spanish army is worn on the cuff of the coat by both officers and enlisted men. It consists of a form of braiding, technically known as galones, of gold, silver or cloth, which extends across the top and down the back of the cuff. These galones vary in width according to rank and are of gold in some regiments and of silver in others. Stars of either gold or silver, to match the galones, are worn by all officers below the grade of brigadier-general.

The distinctive insignia of the various grades is as follows:

Captain-General.— Three stripes of twisted gold braid.

Lieutenant-General.— Two stripes of twisted gold braid.

Major-General.— One stripe of twisted gold braid.

Brigadier-General.— One stripe of twisted silver braid.

Colonel.— Three stripes of gold or silver braid (according to regiment) of five threads each, and three eight-pointed stars, of gold or silver, worn below the galones.

Lieutenant-Colonel.— Two stripes and two stars like those of a colonel.

Major.— One gold and one silver stripe, and one gold and one silver star worn below the galones.

Captain.— Three stripes of gold or silver braid, and three stars to match, worn above the galones.

Lieutenant.—Two stripes and two stars like those of a captain.

Ensign.— One stripe and one star like those of a captain.

Staff-Sergeants.— One stripe like that of an ensign.

First Sergeant.— Three narrow gold or silver stripes.

Sergeant.—Two stripes like those of a first sergeant.

Corporal.— Three stripes of scarlet cloth.

Lance Corporal.— Two stripes of scarlet cloth.

RUSSIA.

Russian army officers wear their insignia of rank on their shoulders, the distinctive badges being displayed upon shoulder straps extending from the sleeve to the collar, when in undress and service uniform, and on shoulder knots and epaulets when in full dress. The following are the designs of the different shoulder straps and the badges of rank worn with them.

For general officers a strap of zig-zag pattern.

General.— No badge.

Lieutenant-General.— Three stars.

Major-General.— Two stars.

For field officers, and staff officers of the same rank, a strap containing two stripes.

Colonel.— No badge.

Lieutenant-Colonel.— Three stars.

For company officers, and staff officers of the same rank, a strap containing one stripe.

Captain.— No badge.

Second Captain.— Four stars.

First Lieutenant.— Three stars.

Second Lieutenant.— Two stars. Sergeant-majors, sergeants and corporals have respectively three stripes, two stripes and one stripe on their shoulder-strap.

The Hussars of the Guard have a special form of shoulder strap but the insignia displayed thereon is the same as that worn by the rest of the army.

In addition to the stars, the shoulder straps bear likewise the numbers or letters designating the unit to which the officer belongs. The different colors of the straps denote the various arms of the service.

JAPAN.

The Japanese wear the insignia of their military rank on their sleeves, the design, which is in the form of a pointed loop of braid, extending from the cuff to a point midway between the elbow and the shoulder. The number of stripes which compose the loop indicate the different grades of rank.

For all officers except those of the Pay and the Medical Corps, the stripes are of gold, for the officers of the Pay Corps they are of silver, and for the officers of the Medical Corps of alternate silver and gold. General officers wear their stripes above a band of gold; all other officers wear them above a pointed cuff of the color of the arm of the service to which they belong.

The colors which denote the various arms of the service are, scarlet for infantry, green for cavalry, yellow for artillery and dark red for engineers.

The sleeve insignia of officers is as follows:

Marshal.— Seven stripes.

General.— Same as marshal.

Lieutenant-General.— Six stripes.

Major-General.— Five stripes.

Colonel.— Six stripes.

Lieutenant-Colonel.— Five stripes.

Major.— Four stripes.

Captain.— Three stripes.

First Lieutenant.— Two stripes.

Second Lieutenant.— One stripe.

The rank of non-commissioned officers is indicated by means of stripes of the color of the arm of the service to which the wearer belongs, worn in the form of a band around the cuff.

First Sergeant.— Three stripes.

Sergeant.— Two stripes.

Corporal.— One stripe.

MILITARY LAW. See LAW, MILITARY.

MILITARY MASTS, in naval architecture, masts on a modern fighting ship, provided purely for military purposes. They are of steel, and hollow, and through them access is had to the conning tower on the superstructure of the deck where are the wheel, the wires communicating to all parts of the ship, and where the captain generally takes his stand; to the fighting-top with its rapid-fire guns; and to the look-out far above all of these.

MILITARY MINING. See MILITARY ENGINEERING.

MILITARY MUSIC. See BAND; MUSIC.

MILITARY OCCUPATION, Law of. See LAW, MILITARY.

MILITARY ORDERS. See ORDERS, ROYAL.

MILITARY POLICE, in the United States army police duty is required of the provost guard; in the British army it consists of mounted and unmounted branches of the regular army service; in France police duty is performed by the gendarmes (q.v.) ; in Canada, the Northwest mounted police do patrol duty, and there are similar bodies in Australia. In South Africa, the Cape mounted police are available for military duty, and there are similar forces in most of the African colonies.

MILITARY PRISONS, in the United States, penitentiaries or prisons set apart for military convicts. Long term prisoners are sent usually to the military prison at Fort Leavenworth, Kan., or on Alcatraz Island in San Francisco Bay. For small offenses prisoners are confined in the smaller prisons connected with forts and barracks. Most of the prisoners in the Department of the East are confined at Governor's Island, N. Y.

MILITARY PUNISHMENTS. See LAW, MILITARY.

MILITARY RAILROADS. The general subject of military railroads includes the location, construction, operation and maintenance of railroads in the theatre of war under military auspices and for military purposes; that is, with a personnel consisting of officers, enlisted men and civilian employees, and for the main purpose of facilitating the movements and supply of an army. The difference between war and peace conditions causes a wide departure of military from civil railroad practice. The more prominent conditions of military railroad service are:

1. Quick results for a short period.

2. A trained personnel for the full development of the mechanical possibilities of the property.

3. Moderate and practically uniform speed requirements for all traffic.

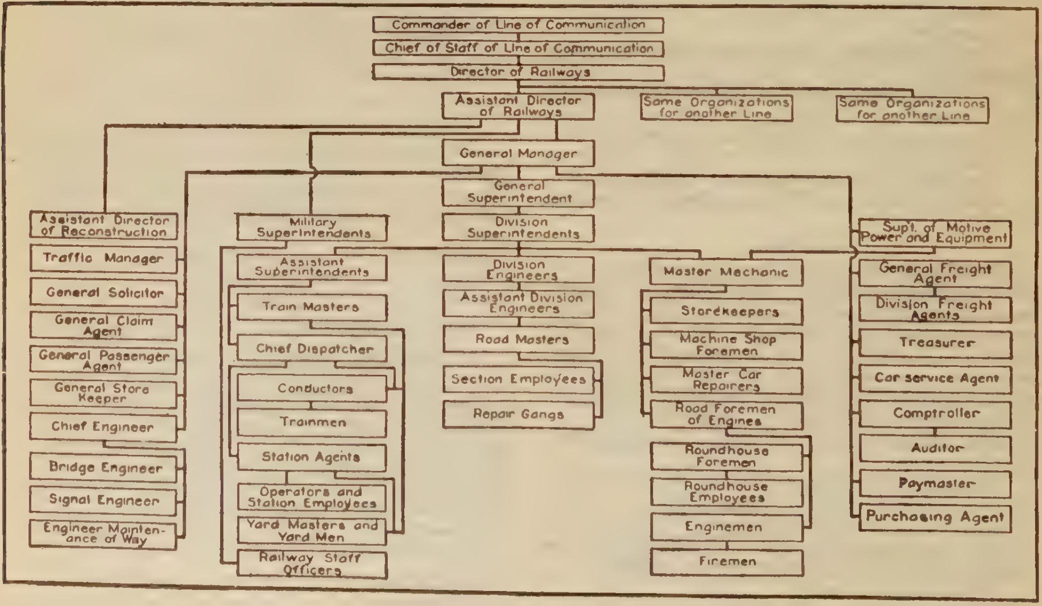
4. A civil road is operated on the presumption that the track is safe; a military road must be operated on the presumption that the track is unsafe.

5. The property is usually in fair but unequal condition, often hastily restored after partial demolition. The operation of the whole depends on the condition of the most inferior parts.

6. A military road is best operated with an ample supply of motive power and rolling stock, and a moderate speed: whereas on a civil road the tendency is to increase speed to economize motive power. The known ratios of equipment and mileage on civil roads cannot be taken as sufficient for military roads.

Railways constructed and operated for military purposes vary from a rough, narrow-gauge road on which the motive power is man or mule, to a fully equipped modern, standard-gauge road. The first would probably be used in the approaches of siegeworks or to supply an army in a winter camp or a fortified position of great extent, and the latter when an existing commercial line is taken over for military uses. Between these two extremes are numerous grades of railways, but each grade shades gradually into the next above and below, and any considerable classification must be artificial and of very little use in discussing the general subject. The only classification that seems logical is to divide them into those that are built and operated *within* and *beyond* the field of the enemy's field of observation and fire. The former are called *combat railways* and the latter *supply railways.*

Within the field of observation and fire of a besieged place practically all movements must be made under artificial cover. The location of



these lines of approach are dictated by military principles, and the line of the combat railway will therefore be determined, not by questions of economy, or ease of construction, but by the location of the siege approaches and parallels. For the same reason, the grade of the line is practically thrown out of the consideration, although a slight change in the direction of the approach might be made to keep the grade of the line below the limiting grade, if by such a change no military advantage were lost. This limiting grade should be kept as low as practicable, for the difficulty of moving cars under such adverse conditions is very great, and for any slope greater than six or eight feet in a hundred, the difficulties of ascent with loaded cars will be great, even for animal traction; and above that, the cars would have to be moved by cable.

The possibilities of combat railways for both offense and defense are very great and have never been fully realized. Guns up to six inches calibre and howitzers of larger calibre can easily be fired from cars. Some blocking up may be necessary. Such use of a railway increases greatly the amount of artillery available in any sector of the defense whence it can be as rapidly moved elsewhere. Owing to the light weight or narrow-gauge cars, an empty car can be easily lifted back on the track if it is derailed. With loaded cars, however, this is not always the case, and car replacers will be necessary to facilitate this replacing without unloading the cars. Whether a road is constructed or merely taken over for military purposes makes no difference in the operation and maintenance of the line. The unit of organization is the *division,* or a section of line from 150 to 300 miles in length which is self-contained. The persons in charge of a military railway are divided into two classes — *Military Controlling Staff* and *Civilian Officials.* The former is chosen from engineer officers and others who have had railway experience, and their function is to make known the military desires and to see that the roads are operated so as to attain these ends. Having given their instructions, they allow the civilian officials and employees to work out the technical details in the manner dictated by their railway experience; the military staff only interferes in cases where they believe that the civil officials are not endeavoring to carry out the military plans, or are not succeeding in doing so. The organization and line of responsibility and the relation of the military controlling officials are shown in the diagram.

The presence of civilian employees on a military railroad, particularly in the lower grades, is likely to prove a source of friction with the personnel of the service of defense, with the railroad troops and with troops of all kinds traveling on the line. Furthermore, the lack of military discipline is prone to cause difficulty in strikes, disagreements as to pay and promotion and individual insubordination and desertion. It is seldom practicable to secure a purely military organization, but in the case of railroads operated in occupied foreign territory effort should be made to secure a military organization with fixed military rank, pay and allowances for all employees, if possible, and in any case for all train crews, yard operatives and the higher officials. The transportation and equipment of railway troops should be that provided for an engineer regiment in so far as relates to supply, shelter and administration: technical equipment with its necessary transportation is furnished as deemed necessary from the base by the director of railways. Sanitary personnel and equipment should be the same as provided for an engineer regiment.

The duties of the director of railways of an army and his staff are, to operate the railroads so as to promote the plans of the commanding general, to supply the military knowledge not possessed by the railway staff and to shield the railway operatives and officials from unauthorized military interference. In any large theatre of operations there are one or more independent lines of railwav. For military purposes all such lines should be operated as a single system under the director of railways. If only one line exists, the director of railways acts as the military executive of the line. If more than one line exists, he acts as military executor of the system and assigns an assistant director of railways to each separate line to act as military executive of that line. If two or more lines of communications exist in one theatre of operations, they might be operated as separate systems under separate heads *if they were entirely separate lines physically;* but if at any point they come together, they should be operated under a single director of railways.

As soon as a railroad is taken under military control, a bulletin for railway use is published, giving the capacity of cars, and the maximum number of cars, loaded and empty, to be run in trains, where the whole tonnage rating of the engines cannot be utilized. The carrying capacity of coaches and other cars is given for both *normal transportation* and *hurried transportation;* the normal transportation is used unless the other be specifically stated, in which case trains are made to carry every available man that safety will permit. Rations to the men on the train are carried in the baggage cars, or kitchen cars if provided.

When an entire unit cannot be carried on one train, battalions can be broken up and certain companies assigned to one train, while the remainder follow in another. The assignment of troops to trains rests with the railway officials. Where regiments carry tentage and camp equipage these are normally sent ahead of the troops in one train and is not divided up amongst the trains carrying the troops. In infantry regiments, the officers' horses are shipped ahead in the train with the camp equipage. In mounted regiments, the first trains carry the horses, with men to look after them. The picket lines and a proper amount of forage are carried on the horse trains. Guns, caissons and wagons follow on trains in the rear of the regiments to which they belong. In loading artillery wagons on trains, they are loaded on the cars from a platform or from portable ramps. They are loaded on one car and run by hand or horse power to the car on which they are to be carried. The openings between cars are covered by plates of iron, or wooden runways, over which the vehicles may run. Unloading of troops and animals at or near the railhead must be expedited in every possible way, platforms and portable ramps being supplied at all unloading points. The method of unloading is the converse of the method of loading.

The defense of a railway against a brigade or division that may be sent against it or its systematic destruction can only be made by a force of sufficient strength to meet and defeat the raiding forces. Besides these attacks by large bodies there are the continual depredations against the line made by small bodies ranging from a regiment down to the lone individual who tries to burn a bridge or misplace a switch. The greatest difficulties in operating a road come from small bands which can operate against the line, especially in a hostile country, without great danger of apprehension. The defense of the railway is usually maintained by the combined use of block houses and armored trains. See RAILWAY ENGINEERING AND CONSTRUCTION and SUPPLY RAILWAYS.

EDWARD S. FARROW,
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MILITARY RESERVATIONS, United States, a general term applied to all military posts set aside for military occupation. In most instances large tracts of land surrounding military forts, schools, barracks, etc., are purchased by the government and improved and adorned; buildings, constructed thereon for officers' residences, parade grounds established and works of defense erected. The Presidio reservation in San Francisco is one of the largest in this country.

MILITARY RULE. See LAW, MILITARY.

MILITARY SANITATION. Military sanitation is largely a matter of engineering combined with discipline. The health and fighting strength of a command is maintained by (1) excluding from the service the physically unfit and those predisposed to disease, by (2) the exercise of surgical and medical skill in promptly restoring the sick and wounded to duty, and (3) by securing preventive measures such as the various vaccinations, inoculations and prophylactic treatments tending to increase individual powers of resistance to disease or to prevent its development after infection. All of these are the special province of the Medical Corps.

The engineering problems connected with camp sanitation comprise water supply, drainage, disposal of refuse (animal wastes, garbage and rubbish) and the selection and laying out of camp sites, or castramentation. Nearly all diseases to which the soldier is subject are caused by germs, which are either little animals or plants so very small that they can only be seen by aid of the microscope. All diseases caused by germs are "catching." All other diseases are not "catching." There are only five ways of catching diseases: (a) Getting certain germs on the body by touching some one or something which has them on it. Thus, one may catch venereal diseases, smallpox, measles, scarlet fever, chicken pox, mumps, boils, body lice, ringworm, barber's itch and other diseases. Wounds are infected in this manner. (b) Breathing in certain germs which float in the air. In this way one may catch pneumonia, consumption, influenza, diphtheria, whooping cough, tonsilitis, spinal meningitis, measles and certain other diseases. (c) Taking certain germs in through the mouth in eating or drinking. Dysentery, cholera, typhoid fever, etc., may be caught in this manner. (d) Having certain germs injected into the body by the bites of insects, such as mosquitoes, fleas and bedbugs. Malaria, yellow fever, dengue fever and bubonic plague may be caught in this way. (e) Inheriting the germ from one's parents.

In both permanent and temporary camps the water supply is a matter of the greatest importance both as to quality and quantity. Where the character of drinking water is the least in doubt it should be made safe by sterilization. The usual method of boiling cannot always be resorted to, owing to lack of time and fuel, and troops in the field generally resort to the chlorination method of sterilization which simplifies the problem. The liquid chlorine treatment, though probably the most efficient, is not adapted to military field use on account of the apparatus required. Of the hypochlorites, that of sodium, in liquid form, is more efficient for its bulk, but that of calcium (bleaching powder) is ordinarily the more readily obtainable. The latter, however, when loose or packed in cardboard, loses its strength very rapidly. It is best kept by making up and bottling a strong stock solution.

The strength used in sterilizing municipal supplies is 0.2 parts per million, that in the field about 10 times as great, or 2.0 per million. In the former case fresh powder, from air-tight drums, is usually available, the mixing is more thorough and the distribution more carefully regulated. Usually also the water has been partially purified by sedimentation in a reservoir. In such cases, 20 minutes is supposed to render the water safe for drinking. For field use, a level teaspoonful of calcium hypochlorite (chloride of lime) is dissolved in two quarts of water for a stock solution. One teaspoonful of this solution is added to a gallon of water, or 10 tablespoonfuls to a barrel. The water is considered safe to use after standing for 30 minutes.

A sterilizing bag, of linen fabric, holding about 40 gallons of water, is issued to troops in the field. As the chemical acts better in clear water, a filter cloth is provided to strain it in filling the bag. The sterilizing medium is calcium hypochlorite, sealed in glass tubes, which are marked with a file to facilitate breaking them without fragments. They each contain about 15 grains of the chemical, which gives a proportion of 2.0 parts per million, sufficient to destroy germ life in even highly infected, though not in sewage polluted, waters. The bag is covered to keep out dust, and the water is cooled by the evaporation of the moisture which exudes through the fabric. Water is drawn off through small self-closing faucets set in a circle around the bag, slightly above the bottom.

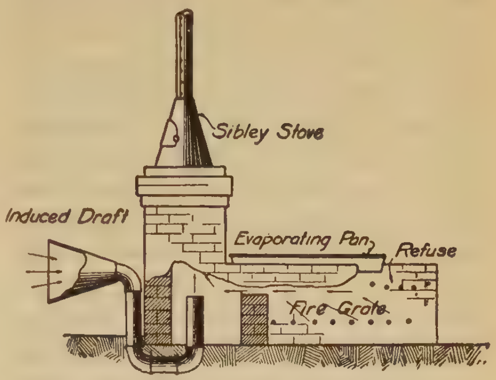
A camp site requiring extensive drainage operations to make it habitable should not be adopted, as even when drained it will remain damp for a long time. Occasionally, however, sites are found which are otherwise favorable, but upon which water may be inclined to stand after a heavy rain. A simple system of ditches constructed by the troops themselves will usually remedy this defect. The camp should never be sited upon the lowest ground in a neighborhood, even if perfectly dry, as drainage during and after rains will then be very difficult.

The interior drainage of the camp is taken care of by gutters along the company's streets and by crowning the latter to avoid puddles and mudholes. Ditches are dug around the tents, directly under the canvas walls, with the earth banked up *inside* the tent. These ditches connect with the street gutters. The ground under picket lines is crowned and gutters dug, leading to lower ground; otherwise, the ground would become very muddy in wet weather.

Animal wastes are the most dangerous to the health of the camp, and naturally the greatest precautions must be taken to see that these are finally disposed of in a manner which will effectually prevent their ever becoming a source of infection or nuisance.

Where a system of water carriage can be installed, this method is of course the most desirable. Its layout and operation will differ little from ordinary municipal practice. Such a system will be quite a tax upon the water supply of the camp, as well as a considerable additional expense, and may require treatment works if the discharge is into an inland river. In tidal estuaries or waters not used for public supplies these works would not be necessary. Where the cost would be prohibitive, or where the water supply is insufficient for water carriage, other systems must be adopted. Various systems of dry sewerage, as the pail system, have been advocated and used to a considerable extent, but are open to many objections, the principal one of which is the hauling or carrying of this matter through the camp. The ground about the pails becomes much polluted, accidents happen in removing them, causing pollution of the ground within the camp, and the final disposal is always a matter of much difficulty. Burial, dumping into water and incineration have all been tried and none found entirely satisfactory. The pollution of water supplies and the creation of a breeding place for flies are the main objections. Incineration usually creates an odor, which, while probably not a menace to health, is distinctly disagreeable when carried to camp. The most satisfactory method has been dumping into large pits, the deposits being covered with crude oil. This prevents odor and keeps the flies out. The problem of cartage through the camp, however, and of cleaning the pails, has not been satisfactorily solved, and leads naturally to an inquiry as to the possibility of making the place of deposit the place of final disposal.

Kitchen wastes and kitchen water must be carefully regarded and removed. Kitchen crematories and incinerators of the most approved types should be freely used. The company incinerator largely used in the United States army which is economical of fuel and efficient in the consumption of liquids and solids is constructed as follows: Dig a pit five feet long, three and one-half feet wide and one foot deep. Fill the ground level with rock. Build a rim wall one foot thick and one foot high on two sides and one end. Bank earth on the outside against the rim walls to the top of same leaving open the end with no rim wall. If clay is available make a mortar of same and plaster it over the earth, banked against the two sides and one end. When hard this clay covering may be whitewashed. A man should be specially detailed to care for the incinerator and keep it clean and neat at all times. The style of incinerator shown in the drawing employs an extra flue to secure an induced draft.



Incinerator with induced draft.

Vermin may be killed with gasoline, or by hot ironing or scorching underclothing. It is comparatively simple, by attention to personal cleanliness, to destroy full-grown lice, but the eggs are killed with difficulty, for they are deposited in the seams of underclothing, trousers, etc. Brush thoroughly, apply heat or rub in the special grease (vermijelli), which smothers the young on emerging from the eggs. Dust also with vermin powder.

In general, the functions of the sanitary service are as follows: (a) The institution of all practicable sanitary measures, to the end that the fighting forces suffer no depletion in strength due to avoidable causes. (b) The temporary care and professional treatment of the sick and wounded and their transportation to accessible points where they are transferred with as little delay as possible to the line of communications. (c) The supply of the necessary sanitary equipment. In addition, the sanitary service is charged with the preparation and preservation of individual records of sickness and injury in order that claims may be adjudicated with justice to the government and the individual.

The personnel of the sanitary service in the zone of the advance may be classified into two general groups, as follows: First, that attached to organizations smaller than a brigade, which functions under the immediate orders of the organization commander and accompanies its unit into combat; second, that attached to the sanitary train which functions under the orders of the division surgeon in accordance with such general or specific instructions as he may receive from the division commander. When necessary the sanitary personnel attached to organizations may be temporarily detached, in whole or part, and directed to operate with the sanitary train.

MILITARY SCHOOLS. See MILITARY EDUCATION; UNITED STATES MILITARY ACADEMY.

MILITARY SCIENCE, Development of. In tracing here the development of military science, we shall begin with the 19th century because everything relating to the military art before its opening may be regarded as taking on, if the expression be not too strong, an archæological character. In a military point of view, this century divides itself naturally into certain well-marked periods. We have first the great era of the Napoleonic wars, closed by the battle of Waterloo. This is followed by long years of peace, broken at last by the Crimean War. The next period to come under notice is that of our own Civil War, in which, in reality, modern conditions of warfare may be said to have taken their rise. The use of independent cavalry, the proper organization of field artillery, the entrenched battlefield, the influence of railways, to say nothing of other particulars now regarded as essential by all military nations, find their first formal expression, if not always their full development, in this great struggle. Recrossing the Atlantic, the next term in the military progress of the century is found in the rise of Prussia, through the defeat of Austria in 1866, as a power of the first rank, a position confirmed four years later by its complete overthrow of France. Since that epoch, military development, where fostered, has consisted almost wholly in an imitation, more or less close, of the German system of organization. These last years are marked, moreover, by a hitherto unparalleled application of the arts and sciences to the improvement of the material of war.

It is clear, then, that the growth of the military art during the 19th century was in no wise a direct function of the time. In some of its most notable aspects the art developed more rapidly during the past 40 years than it had in the preceding 100. So conspicuously is this true that we may not assert that its state at the opening of the century was even a transition state. In all countries, with the exception of France, the conditions of the 18th had overflowed almost unchanged into the 19th century. The era was that of the great Frederick. His example still bore undisputed sway, to such a degree, indeed, that the husk was mistaken for the kernel, the appearance substituted for the reality. The armies of the day were in all essentials hired armies, the soldiers mercenaries, in the sense that war was largely a trade. Organization, recruiting, mobilization, administration, supply, transportation — all these, the life-blood of a modern army, were, if not unknown, at least not understood as they are to-day. They had not as yet been generalized into a continuing system applicable to a state either of peace or of war.

Similarly of arms and of equipment: the flint-lock musket, found in the hands of the troops of all armies, had been for many years substantially a constant quantity, while gunpowder, the only explosive and propelling agent employed, had an unbroken ancestry of centuries of continuous use. The great objective in the training of men, France again possibly excepted, lay in the development of a machine-like precision of drill, and this rigidity was carried so far as to convert manœuvring, even under fire, into a sort of geometrical exercise. On the field, deep columns and serried ranks were the rule. Infantry opened fire at 200 yards with uncertain, if not innocuous, results at superior ranges. Naturally, under these conditions, cavalry could and did intervene directly in the decision of affairs on the battlefield. The range of field artillery was limited, and, until Napoleon's appearance, its powers and possibilities were not, on the whole, well understood.

The picture changes when we turn to the 20th century. The army is now the «nation in arms»— that is, war is no longer a trade, but a duty, and preparation for war a personal obligation to the state. Upon a declaration of hostilities, at the present day, the effort is made to bring the full strength of the nation to bear, or in other words, mobilization takes place. But this implies a full degree of preparedness, and preparedness, in its turn, a thorough study and application of the principles of organization and training, of supply and administration. Here we touch upon a well-defined characteristic of final as contrasted with initial conditions; preparation for war goes on unceasingly, in times of the profoundest peace, although no possible cause for war can be discerned in any direction. On the material side, the transformation is equally complete. All the possible resources of modern science have been levied on to contribute their share not only toward the improvement of weapons and of war material in general, but toward supplying the means of placing and maintaining an army in the field. Where 100 years ago but one explosive was known, modern chemical science has supplied hundreds, and the end is not yet. Whereas, in the days of our grandfathers, any respectable foundry could turn out serviceable guns, to-day, the gun is the finest product of metallurgical science, and its construction necessarily limited to specialists. Instead of the flintlock, harmless beyond 200 yards, we have the magazine rifle, sighted up to 1,800 yards, and deadly two miles and more away. The muzzle-loading field-piece of limited range and accuracy has given way to the rapid-fire, breech-loading field gun, delivering from 10 to 15 aimed rounds of shrapnel a minute upon a target so distant as to be practically invisible to the naked eye, with an accuracy so great in trained hands that exposure is suicide. Under these conditions in open combat, the masses of elder days have dissolved into thin lines of invisible skirmishers, and cavalry has all but disappeared from the field of actual conflict. In general, armies have increased vastly in size, and important battles last for days and even months.

In war, as in everything else, the secret of success lies in organization and preparation. It is interesting, then, to note how two separate and apparently independent conditions have been combined in the evolution of the modern army. The first of these in time, and, with reference to actual combat, in importance, is the creation of the army corps by Napoleon in 1805. What a long step forward this was may be inferred from the fact that Frederick the Great's army was not formed into even brigades and divisions. Besides assuring unity of command, the creation of this strategic unit has led in modern times to the full recognition and definition of the «tactics of the three arms.» All modern armies, therefore, whether they belong to military or to unmilitary nations, on taking the field are formed into corps, and these corps are maintained as organic units in times of peace by the great military nations of the world for administrative as well as for purely military reasons.

Hardly less important as leading to a principle of organization was the limitation imposed by Napoleon after Jena upon the size of the Prussian army. This was never to exceed 42,000 men, and, in fact, it never did; that is, at no time while the limitation was in force did Prussia keep more than that number of men under arms. But, thanks to Von Scharnhorst's foresight and intelligence, the members of this army were continually changing. As fast as trained, they were liberated to make room for new and untrained men. With the immediate results of this idea we are not here concerned: what we wish to bring out clearly is that this plan of organization, originally local in both time and circumstance, is to-day fundamental in the formation of the armies of all military states. Indeed, these, if the paradox be permissible, may be said not to have a regular army at all. Great Britain has one, as have the United States, but in all other important nations the condition of universal military service has made the distinction superfluous, if not meaningless, by wiping out one of its terms. Hence, with the exceptions noted, a mold exists, so to say, a form, through which all citizens capable of bearing arms have to pass. From this comes the dictum, «The army is to-day the nation in arms,» as distinguished from the purely professional army of the earlier part of the century. The application of the principle of universal service has resulted naturally in a classification of the male population with respect to service. Thus we find in Germany the active army made up of the men with the colors, the reserve of the active army, the Landwehr and the Landsturm (q.v.). Classes more or less similar exist in other countries under different names, the underlying principle being, however, substantially the same in all. This principle further leads directly to the distinction between peace footing and war footing, passage from the one to the other being effected by mobilization, an operation unknown at the opening of the century. Since, moreover, the whole nation is the army, it results that the modern army has greatly increased in size, a result that would prove embarrassing but for the existence of the staff. It is clear that the formation, instruction, training, supply and administration of this army form a task of the greatest magnitude. Furthermore, when once formed, if it be not intelligently led and accurately directed upon its objective, it runs the risk, from its mere size, of degenerating into an armed mob. Hence the conditions leading to the formation of the modern army have led, *pari passu,* to the formation of the modern staff. This simply means that by a natural evolution the functions of the staff have expanded until they now include duties not formerly contemplated. Thus the conception of a general staff, whose special business it is during times of peace to study and prepare for any campaign whatever on any theatre of war whatever, is distinctively modern. The existence of such an organization is evidently a necessity due partly at least to the great size of modern armies. This very condition, by increasing the difficulties involved, has suggested the only cure of these difficulties — a body of specialists trained to weigh them in peace and to remove them in war. And so of the administrative staff under the same conditions: the supply of an army, taking that term in its most comprehensive sense, is reduced to a continuously operating system. Obviously this particular question could not be left to look to chance for its answer.

The limits of this article forbid more than a mere mention of the influence of the railway, of the telegraph and of the telephone. The telephone is in current use upon the battlefield and wireless itself has been applied to military purposes both in action and in manœuvres leading to action. Without the railway, rapid concentration and regular supply would be impossible, a matter of capital importance in view of the great numbers enrolled. It would be hazardous to assert that it has been a prime factor in determining these numbers, but there can be no doubt that it has wielded a great influence in this direction. Other things being equal, it is logical and proper to have a large army, because the means of transporting and of supplying a large army are at hand.

The art of war is usually defined to consist of two elements, strategy and tactics. Of these, the former is essentially immutable, its principles, few and simple, having remained unchanged throughout the whole course of history. The only recent development in strategy is one, therefore, affecting not its principles, but the means of applying those principles. The employment of the railway, of the telegraph and of other means of communication has greatly increased the rapidity with which strategic combinations may now be carried out, and has added to the number possible within a given time and area. In general, then, strategy is not a measure of the changes occurring between any two given epochs, while tactics, on the contrary, responding sooner or later, if not instantaneously, to any new influence, does furnish such a measure. We shall here briefly consider the tactics of infantry from this point of view, because this arm is still the «queen of battles,» and the others have to conform to its possibilities.

To clear the way, let us recollect that the tactics of infantry had remained substantially unchanged from the days of Gustavus Adolphus to those of Frederick the Great; that the latter, by the use of lines in place of columns as a habitual formation, had increased the mobility, and, by the substitution of an iron for a wooden ramrod, the rate of fire, of his troops. As, however, the range of the musket was extremely limited, fire was opened at very short distance, and, independently of any system of tactics, the bayonet was, therefore, a weapon of great importance. Indeed, it might happen on a rainy day that the bayonet was the only weapon available. As was but natural, Frederick's system, known as the «linear» system of tactics, was copied by all other armies.

With the French Revolution came a change. Unquestionably inspired by our own Revolution, in which, for the first time, skirmishers appeared on the field of battle, the French abandoning the precise linear system, substituted therefor small columns for manœuvre and assault, and deployed lines for firing. In manœuvring, skirmishers covered the front, unmasking it as each company arrived on the firing-line. We note at once that this employment of skirmishers is not the modern use, but, nevertheless, it marks the breaking of tradition. The French system, known as the perpendicular, was followed in all Napoleon's earlier campaigns. In 1805 he prescribed that the normal formation of the division should be by «linked brigades,» a disposition carrying with it the advantage of giving each brigade a separate objective. This principle is to-day fundamental in combat-tactics, even the company having its designated objective.

Frederick's system, decisively beaten at Austerlitz, was finally overthrown at Jena-Auerstädt, and, in 1813, the tactics of the French, including the use of skirmishers, became universal. But before this the English had adopted a two-rank formation, and had successfully opposed thin lines to the heavy columns which the French, for reasons into which we need not here enter, had apparently found themselves compelled to readopt in the Peninsula. In fact, the type-formation was not as yet firmly fixed, the English using heavy columns at New Orleans, and the French, in spite of their experience in Champagne, resuming them with disastrous results at Waterloo.

All the changes here touched upon, it will be noticed, are independent of any change or improvement in weapons, and are simply efforts in the direction of increased mobility and flexibility. Passing by the Crimean War in which, apparently, the experience of the past had been totally forgotten by both sides, we reach our own Civil War, «remarkable as a turning-point of tactics, there being scarcely a feature of the tactics of the present day that did not have its germ, its prototype, or its development in that great contest.» Both armies were now armed with the rifle, the extreme range being 1,000 yards; in the Union army the breech-loader made its appearance before the end of the war. Markmanship was of a high order on both sides, and infantry fire consequently so deadly as to effect marked changes in tactical formations. These are, briefly, attacks by rushes, attacks in successive deployed lines, the use of heavy lines of skirmishers in place of the line of battle, and the use of hasty entrenchments. They were brought about by the common sense of the American soldier, who, unhampered by tradition, knew how boldly to adopt his tactics to the confronting situation.

Europe, however, was slow in learning the lessons of our war. In 1866 the Prussians, using the breech-loader against the Austrian muzzle-loader, generally attacked in company columns, preceded by skirmishers, who were ordered to feel and develop the enemy. But the Prussian privates instinctively left their columns to join the skirmishers, with the result familiar to all. Strange as it may seem, the Prussian authorities failed to appreciate the new conditions of warfare, for, deprecating «the disorder and tumult of the impromptu attack-formation, which had sprung into being under the Austrian fire, ... they waited for the appalling losses of a greater war to emphasize the necessity of a change in their prescribed tactical methods.» This experience came in 1870. Both combatants were now armed with the breech-loading rifle, the Chassepot being effective at 1,300 yards. Before the end of the war, under the superior rifle fire of the French, the Germans found themselves compelled to deploy their columns, the direct attack being made, and the hostile position invariably carried, by the rushes of swarms of skirmishers. All the nations of Europe now hastened to bring their tactical systems into agreement with the experiences of the Franco-Prussian War. But it took still another war to drive home the conclusions reached by us in 1861–65. The Turks, in 1877–78, armed with the Peabody-Martini rifle, a weapon vastly superior to any heretofore used, by their use of the American system of hasty entrenchments compelled the Russians finally to deliver their assaults in successive lines of deployed battalions.

This very brief outline shows us that the revolution wrought in infantry tactics has been due almost wholly to the improvements in the rifle. The most recent of these, namely, the introduction of rapid fire through the use of a magazine, will simply carry on the development along the lines already laid down, while the advent of smokeless powder has increased the powers of the defense. All the conditions of the modern combat, therefore, combine to make the frontal attack the exception, flank attack the rule, a principle which is characteristic of modern tactical methods. And it should be recollected that where flank attack is impossible (e.g., on the western front, War of 1914), frontal attacks are preceded by artillery preparation of so intense a character, that, under these circumstances at least, the artillery is the principal, the infantry, the auxiliary, arm.

But progress has been marked in other directions as well. We may remark the importance of «combined tactics,» or «tactics of the three arms.» This, of course, is not a new idea; it has simply received fuller expression through a more stringent application of the principle of division of labor, growing out of the universal recognition of the corps as a strategic unit. As this is really a complete army in itself, though on a small scale, so its full effect can be felt only in case all the arms composing it act in concert to secure the common end. Hence, the powers of the three arms are, perhaps, more accurately measured, their relations to one another better adjusted. The new rôle of cavalry, too, deserves notice. If it has lost its former weight on the actual battlefield through the power of both infantry and artillery fire, it has gained in consequence of its employment in independent masses. Operating far in advance of the army, it is the purpose of these masses to cover its concentration and to screen its movements, while seeking at the same time to prevent the formation of the hostile forces, and in any case to discover their emplacements, numbers and objective.

In other ways, too, it has gained. The dismounted fire-action of this arm — that is, its action on foot as in infantry — is now recognized, the alternative being helplessness on the tactical defensive. So highly have we developed this mode of using cavalry in our own country that many foreign writers have asserted that our cavalry is only mounted infantry. Our answer is that all European mounted troops are either reluctantly or unconsciously conforming to the type of the American cavalryman of 1864–65, without abating one jot or tittle of their right to be, and to be called, cavalry. In England, chiefly, a solution was sought in the creation of mounted infantry. The idea here was that the horse shall serve purely as a means of rapid transportation, his rider dismounting on reaching the scene of action. No better example can be found than that furnished by the British themselves in South Africa, in their attempts to cope with the mobility of the Boers. The reader will recognize at once in the mounted infantry a reversion to the original type of dragoon. But mounted infantry has now ceased to exist.

We may fitly conclude this part of the discussion by drawing attention to the increased responsibilities devolved by modern conditions of warfare on the private in the ranks. He has ceased to be considered a machine, mere food for powder, a molecule of the mass whose shock is to crush the adversary. On the contrary, as many occasions will surely arise calling for the exercise of sound judgment, so is he expected to be an intelligent element of the national defense, his value to his country bearing a direct ratio to the degree to which his intelligence can be awakened and trained.

No survey of the subject would be adequate without some reference to the immense development given by the mechanical spirit of the age to the enginery of war. Of course, the impulse in question is not purely military; it is simply the application to war of a principle pervading every other phase of life. In general, every invention that might possibly increase the economy, certainty or rapidity of a displacement, whether of men, of material or of projectiles, has been summoned to give its share of improvement. All inventions bearing on the transmission or acquisition of intelligence have been pressed into service. One of the latter is the balloon; it antedates the century, but the idea of photographing the enemy's position from its car is new. So is the application of wireless telegraphy to purposes of communication in the field; this invention was turned to a military end almost before it had definitely left the inventor's hands.

The greatest advance, however, has been in the perfection of man-killing machinery. Upon this one subject have been expended all the resources of modern metallurgical and chemical skill until the projectile weapon of the day, whether gun or small-arm, is a marvel of strength, accuracy and convenience. From the rude tube of our forefathers we have passed to engines of complicated structure, deadly beyond the limits of unaided vision, and of a rapidity of fire undreamed of even 30 years ago. So great is the volume of fire, so destructive the shrapnel, that in field artillery duels the question of success is reduced to that of being the first to get the range. Each class of guns must now have its special propelling agent, and a serious effort is making to discover some means of launching in safety the frightfully destructive explosives due to modern chemical research.

Side by side with this sort of development has marched that of the art of protection. But here, in contrast with the increasing complexity of the means of offense, we remark the increasing simplicity of the means of defense. At the dawn of the century, the genius of Vauban still prescribed the bastion system for any and all sites to be fortified. Just as in the field, rigid and pedantic notions governed all troop-evolutions, so in fortification the prevailing idea in each case was to furnish a rigid geometrical solution. But later the idea was first of all to adapt the work to the site, independently of the type. Steel turrets, cupolas, armored casemates, were provided for specially exposed points — a solution made possible by the great general advance in metallurgy. Concrete displaced masonry, and the face presented to the enemy was always either of earth or, where that was impossible, of steel.

Upon the general question of fortifications, authorities were divided into two camps. Those of the first asserted that fortresses covered a mobilization, retarded the enemy, allowed a defeated army to refit under shelter. Their opponents, on the other hand, maintained that they tied down an army, reduced the numbers of the field armies; that forts would be covered and not reduced; that they would not keep out a superior, and would be useless against an inferior, enemy; and that a government could not afford to man them, if the antagonists we e otherwise evenly matched. In the meantime, the frontiers of Europe bristled with forts, and most important capitals were the centre of a vast entrenched camp. The great contribution of the 19th century to the question of fortification was not so much one relating to the type, though this was marked, as one relating to the occasion. From hasty or improvised entrenchments these latter days have seen the evolution to such defenses as those first of Petersburg, then of Plevna, and lastly of the battlefields of the War of 1914, erected not with the deliberation of peace, but under the stress of war, to meet its exigencies as they arise. See FORTIFICATIONS.

The principles hereinbefore set forth came to their full growth during the World War. The nation in arms, the importance of communication, the application of mechanical resources, the power of artillery, all these and other matters as well, received in that war an extension undreamed of before. To these must be added aeronautics and the use of the motor vehicle. So marked has been the effect of all these elements, that on one front, the western, war may be said to have changed its face, in that it passed from field fighting to trench-fighting; it is within the compass of the truth to say that on this front we have had the phenomenon of two armies besieging each other. And this example is typical of future conflicts between two numerous, brave, highly-trained and completely equipped adversaries.

The principle of the «nation in arms» coupled with growth of population (Germany) or with the existence of a great population (Russia) has led to the formation of armies so vast that operations pure and simple are continental in range, e.g., western front, from the Channel to Switzerland; eastern, from the Baltic to Rumania. Hence violations of neutrality with consequent degradation of international law. The needs of the vast modern hosts call for an equally vast development of the systems of transportation. Hence not only are railway systems increased in time of peace, sometimes merely for future military necessities, but motor transport has been, and will in future be, called upon to the limit of its possibilities. An excellent illustration is furnished by the French at Verdun, regularly supplied by a train of over 6,000 motor vehicles. But the application of motor resources is only one item of the «mobilization of industries» by a nation at war, a mobilization as vital to success as the science of the generals and the valor of the men on the line, and that will assuredly be a factor of dominating importance in any war to come. In other words, whenever a great nation goes to war, not only must it put into the field and there maintain enormous armies, whose effectives are numbered by millions, but the energies of the people at home must be wholly concentrated upon the supply of those armies in the field. The expression «the nation in arms» has taken on a new and significant meaning.

The most important of the supplies just mentioned, in a purely military point of view, is that of munitions. For side by side with other improvements has gone the evolution of artillery. Foreshadowed in the Balkan wars, it is accepted as a principle that an army must be accompanied not only and merely by the classic field piece of small calibre, but also by large-calibred pieces, effective not only against troops, but against positions as well, and not only against positions taken as the fortune of war may dictate, but against positions, i.e., fortresses, or their future substitutes, carefully prepared in time of peace. For the evolution of artillery has caused fortresses as such to lose their value: Liége, Namur, Maubeuge, Antwerp proved of no account, and if Verdun held out, it was not because of its strength as a fortress, but simply because it had become a sector in a long line, like that of Ypres or Arras. It has been made abundantly clear by the war that cities, capitals, fortresses and provinces will be taken in vain, so long as the enemy army remains unbeaten.

When two armies are besieging each the other, and resting on impassable flanks, only frontal attacks are possible: this has produced a strength of trench that can be overcome only by the intensest long-continued artillery fire using high-explosive shell, an expense of ammunition made possible only by mobilization of industries. Under these conditions, «lines» have become literally areas of trenches, one line behind the other, joined by communications. The capture of a first line may be a success of no value. In the defense of these entrenched lines, the machine-gun has played during the European War, and will play in the future, in field-, as well as in position-fighting, a part of the first importance. Mining and counter-mining, heretofore used only in sieges of regular fortresses, will have peculiar weight when two entrenched armies face each other over a long front impossible to flank. And these armies will normally live, move and have their being under the ground.

A feature of trench warfare in the World War was the occasional but deliberate use of asphyxiating gases and burning liquids. Whether in the future this violation not only of The Hague Convention but of fundamental humanity will be endured only experience can tell but there is every reason to believe that asphyxiating gases have come to stay. The end of the war saw them used in cloud form, and in projectiles (projection and artillery projectile proper). That is, the gas projectile had won its right in open warfare, and had become as much a necessity as the shrapnel itself.

The greatest advance in the military art proper has resulted from the application of aeronautics, the great contribution of the 20th century. First shown to be practicable by the Wright brothers, aviation, neglected in America, was at once seriously taken up by the French and converted to military use. The rest of the world (the United States and Great Britain excepted) soon followed suit. The aeroplane has been without influence on strategy, but has profoundly affected tactics. It has made surprise well-nigh impossible and dissipated the fog of war. Thanks to its assistance a commanding general now *sees* the enemy, and what is more sees him almost at once. Hence combinations of troops, movements, concentrations are reported almost as soon as made, intentions laid bare and adequate measures of prevention made possible in good time. The aeroplane moreover has proved itself indispensable to the artillery by correcting fire and by detecting hostile batteries whose emplacements would otherwise be unknown. As an agent of destruction, it was not nearly so useful at first as it was in the acquisition of information. But as the war progressed bombing became generalized on both sides; with direct military results when employed against railway stations, depots, ammunition dumps, troops in concentration and even in combat. The airship (Zeppelin) has on the whole disappointed expectation: it should be recollected, however, in respect of both airships and aeroplanes that the whole subject, in spite of the experience of the Great War, is still visibly in its infancy. See MILITARY AERONAUTICS.

Whether other wars will follow the great conflict that broke out in 1914 no one can undertake to say. In the meantime it may be safely asserted that human nature, integrated into national ambitions, will continue to be what it always has been. Hence future struggles are not unlikely. When they do occur, they will call into play the whole of a nation's energy. High courage, nobility of principles, unselfishness of ambitions, these alone will not avert defeat and disaster.

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MILITARY SERVICE INSTITUTION OF THE UNITED STATES, a society of officers of the United States regular army, organized in 1878 by Generals Fry, Stanley, Rodenbaugh, Colonel Lieber and others. It was designed as a similar organization of the Royal United Service Institution of Great Britain. The presidents of the American Society have been Generals Hancock, Schofield, Miles and Ruger. The headquarters are at Governor's Island, N. Y., where the institution has acquired a library of 20,000 volumes, including many rare documents. The society issues *The Journal of the Military Service Institution.*

MILITARY SURGERY. Military surgery was first recognized as a separate branch of medical science about the middle of the 16th century, but was not taught as a special study in medical colleges until the year 1829. Since then instruction has been given by the ablest surgeons both in Europe and America.

At no time in the history of the world has there been so great a number of powerful and destructive instruments of war as during the terrible conflict of the great World War. Statistics prove that at no time has there been so great a saving of life among the sick and wounded. We must not be surprised to note that a great part of mankind has occupied, and still continue to occupy, themselves in the improvement and perfection of the art of war, and that this art of destroying life is constantly advancing.

For the earnest, faithful army surgeon many opportunities for careful study and close investigation are offered. Perhaps on his skill in caring for the sick and wounded depends the success of a campaign. The well-defined and carefully prepared plans of our ablest generals have been defeated and come to naught through the incompetency of medical officers. It is, therefore, the duty of the military surgeon to prevent, as far as possible, all useless expenditure of life. If battles must be fought, the results should be obtained with as little mutilation, suffering and sacrifice as is consistent with life and the welfare of the cause. For this the world is indebted to our profession.

Subjects absolutely necessary and important for the surgeon to understand in performing the duties that pertain to an army surgeon are: In addition to climatic condition, he must have knowledge of the location of the country from which the soldier comes and his surroundings there; knowledge of the care of the individual —clothing and personal hygiene. It is to be remembered that the majority of soldiers are made up of youths from the age of 18 to 25, and, generally speaking, they know very little about the care of themselves individually. In the examination of the selective draft man the medical department must learn all about his habits, some of them to be corrected, as he enters upon his military life, and others of such a nature as to exclude him. The study of hygiene is of great importance, such as the care of the camp. In 1917 soon after our men were assembled at the cantonments there was a development of chest trouble, such as bronchitis and pneumonia. Surgeon-General Gorgas made a very thorough, personal inspection, discovered it was the result of an overcrowded condition, very difficult to correct, but attended to as rapidly as possible and resulting in immediate lessening in number of the sick. Also the kitchen, cooking utensils, drainage and sanitary surroundings of every kind should be carefully studied. The subject of food supply and its manner of preparation exacts great interest on the part of the medical officer, regarding a correct diet. You might present a meal to the British soldier that would please him very much, but it would not be well received by the American soldier, or those of other nations. The medical officer must inform himself also upon the nature of all insects, vermin of every description, the evil effects of even the house-fly, for at the present time all of these factors enter into the development of diseases that disable and impair the best work of the soldier. He must understand fully all that pertains to the quartermaster and commissary departments, in order that his sick may receive such luxuries and comforts as are their due. His knowledge of camp diseases is absolutely necessary — typhus, typhoid fever, for all infectious diseases come to him and must have immediate attention. These are conditions that will admit of but a few hours' delay, and then attention to minor cases, such as the care of the feet, is so very important. Within a few years the specialty of chiropody has advanced in a marvelous manner, and the soldiers are fortunate in having with them a number of attachés of the hospital who are competent to give proper treatment. Proper care must be taken of the feet, and perfectly fitting socks and shoes is another of the admirable methods adopted by the surgeon-general's office, all this working to the advantage of the soldier.

The military surgeon must have an acquaintance with many medical problems: The conditions developing diarrhœa and dysentry, the exposure to heat and cold, causing sunstroke and frost-bite, all of which he must be familiar with; the condition and treatment of the various classification of burns that occur from fire and from the materials used in some of the high explosives, also the care of the soldier who suffers so seriously from multiple wounds made by the explosion of the so-called «mud shell,» the particles penetrating the clothing, and where there are often 50 to 100 abrasions that are very painful. A responsibility of grave importance is the selection of the camp site, and which is usually entrusted to the medical officer, as it should be.

When the United States entered into the European War the surgeon-general's office, endorsed by the War Department, organized schools of instruction. The splendid response made by the members of the medical profession to comply with the government's request that they have a few months' preparation for army service enabled thousands of doctors to better fit themselves for looking after the sick and wounded soldiers than in any of our previous wars. It was said by United States army surgeons, when this war began, in August 1914, that, in many respects, it would be the most humane ever waged; that it would be settled in a much shorter period of time than most persons believed possible; however, this prophecy came far short of the real result. Today dressing stations, evacuation and base hospitals are terms with which we have become very familiar. It was stated, and this proved true, that the mortality list from disease would be very small. The control of typhoid, typhus and malarial fevers was very perfect. Alas! that the epidemic of influenza and septic pneumonia presented so many serious conditions hitherto unknown, causing a death rate that, while not large, yet was unexpected.

While it was believed that the rapid-firing rifle, with its smaller metal cap bullets, would disable men quickly, the results would not be so fatal in the loss of life, and would not cause so great a number of seriously injured as when the slow-firing, larger bullets, such as was the Minié ball, used during the Civil War. This, to a great extent, proved true. The breaking of bones, the tearing of blood vessels, the injuries to nerve trunks, in proportion to the number of wounded, was not as great in the European War as in some of our recent conflicts.

Much important experience had accumulated during the Russo-Japanese and some of value during the Spanish-American War. In the European War as a whole, wounds were not so fatal, but the prediction that there would be a less number of infective wounds and injurious complications did not prove to be true. The knowledge of preventive methods, and important sanitary precautions, helped decidedly in the saving of life, as they were so vigorously investigated and carried out. The sad lesson of the Spanish-American War had served to warn our medical officers and they made a noble success of all that was placed at their disposal for the care of the soldier. One can enumerate but a few of the many aids that came to the medical and surgical departments of the American army, in the European War, such as the Red Cross, the Y. M. C. A., the Y. W. C. A., the Knights of Columbus, the Salvation Army, the establishment of canteen huts, stations at the front for dressing of wounds, the evacuation hospitals, base hospitals, methods of transportation, which have never been equalled, and the statistics that have been compiled prove greatly to the credit of our surgeons that they did all that was possible for the sick and wounded soldiers.

When war begins suffering and pain enter, and the surgeon, having everything in readiness, endeavors to relieve his patient as promptly as possible. The use of anæsthetics has passed through a very thorough analysis, resulting in the positive doing away with all mixtures of ether, chloroform and alcohol, for they have met with little endorsement in military operations. The same experience has come to many surgeons in civil life as the unequal evaporation makes their use somewhat uncertain. The administration of ether, or chloroform, separately, with plenty of air, has resulted very favorably. It is to be observed that many of the writers on the subject have endorsed placing the patients under a minimum narcosis, then watching them very carefully, and the after effects have been excellent. Local anæsthesia seems to have inspired a good deal of confidence, particularly among those who worked mainly in the evacuation and base hospitals, as well as rest homes.

As the battle opens the sight of blood is the first object lesson to the alert surgeon. For lack of prompt and efficient treatment of hemorrhage many a soldier has yielded up a noble life. The control of hemorrhage has been carried out along the lines of the civil surgeon. Momberg's method of controlling hemorrhage, for amputation at the hip-joint, does not seem to have met with any great advance, and the number of operations done are comparatively few. The use of the tourniquet in some form has been applied by fearless assistants and the stretcher-bearers in so intelligent a manner that many lives have been saved. Wyeth's method has been of service.

Surgery of the heart has presented some very striking illustrations of progress, in keeping with the advances of the past few years in civil life, regarding the operations done in this direction. Especially is this true in bayonet and stab wounds, and here an excellent opportunity is offered for securing an estimate of the final results. There are so many more cases to be studied than in civil practice. Much research work has resulted and more operations were performed than could possibly have occurred in civil life for decades.

It is interesting to note the treatment of such large vessels as the inferior vena cava and others that have been reached when operating upon wounds of the abdomen. Injuries to the arteries and veins have developed a large number of traumatic and arterio-venous changes. Apparently nothing has escaped the military surgeon of to-day. Surgery of the blood vessels, in the form of traumatic aneurisms, as well as like surgical procedures, will, when the concensus of opinion has been reached, show that great skill has been exercised from time to time in doing this work.

Possibly there is no part of the body that will show such marked advance in immediate operative interventions as that of gunshot and stab wounds of the lungs, together with more or less fracture of the thorax and in the lodgment of foreign bodies within the cavity of the pleura. This is well illustrated by the entrance of a portion of shrapnel within the cavity of the lung. An immediate operation is done, at the nearest place to the receipt of the injury, with safety to the operator and assistants, the wound enlarged, portions of fractured ribs removed, if required, hemorrhage controlled as promptly as possible, the lung exposed, the foreign substance searched for and removed, then thoroughly aseptic work accomplished, the wound closed, with or without drainage, and a very large proportion of these patients make a prompt recovery, without suppuration. The employment of air bags, sacks or balloons to fill space, and for the lungs to press against — removing them gradually — apparently has proven of value. No such splendid work as this has been accomplished in the history of any of our previous wars.

This same prompt operative intervention also applies to wounds within the abdominal cavity. There was a marked contrast in the history of surgery during the first year of the World War, and that of the last, regarding the advances made in the treatment of these wounds. In the first period many surgeons were of the impression that non-operative interference in a penetrating wound of the abdomen led to more successful results, but, gradually, in the study of these cases, they became more practical, and, as a result of their observations, surgery was pushed to a point of careful inspection and operative work, where «the sooner the better» it was discovered. So soon as the patient could reach a place of safety, and proper appliances, an operation was done at once, consisting of opening up the abdominal cavity, if necessary resecting the intestines, or properly closing all wounds or lacerations within the cavity of its contents, controlling hemorrhage, and then carefully closing the wound. It has been shown that many of these cases die of hemorrhage if not operated upon at once. Only in such cases as seemed absolutely necessary was drainage made use of, and the percentage of recoveries has been most marked. In these wounds, and which also applies to the cavity of the cranium, the same bold successful surgery was done in enlarging the opening in the skull, trephining as called for, placing the patient in as comfortable a position as possible for transportation — which applies to all wounds in any portion of the body — not handling any more than can be avoided, the dressing watched carefully, not to be disturbed, if all goes well, and when reaching the base hospital keeping them absolutely quiet.

There is no doubt that when the final chapter on the history of surgery in the Great War is written, there will be largely to the credit of the skilled and able surgeon a record of such great progress as will astonish the medical man, who can yet look back and call to mind his experiences during the Civil War, the Franco-Prussian War, the Spanish-American War and the Russo-Japanese War.

Never had an army had such eminent specialists to care for their sick and wounded. Great advances also resulted in the splendid manner in which the question of transportation was solved. No army ever had such a perfect system of ambulances — electric and otherwise — steamboat and railroad facilities, and the avoidance of handling the wounded added greatly to their recoveries.

Especially to the credit of the American surgeon was the adoption of the method of continuous treatment from the dressing stations to evacuation and base hospitals, and the standardization of splints. This was kindly received on the part of the surgeons in the various armies, and proved of inestimable value. In all the various wounds that were studied and treated, during the nearly five years of the war, it is plainly noticeable that, step by step, surgery advanced, with that degree of success, that the final summing up will demonstrate the greatest progress in history, in the ability to return men to the fighting ranks, with so little loss of service, and in the actual saving of life.

Another chapter has been added to making surgery a more exact science. The art, the skill, could scarcely be improved, for in other wars we have had evidence of some of the most scientific operations possible for human ability to perform; however, the great advantage this modern military surgeon possesses, in instruments, operating paraphernalia, dressings, splendid nursing, can not be excelled in the best of civil hospitals and all this aided materially in the wonderful success.

Great gratitude is due the women of America for much of these splendid results. Their weary days of preparing surgical dressings have been well rewarded. Out of it all there came a knowledge of the treatment of wounds that is apace with the fierceness exhibited by the cruel weapons employed in this recent war, and with more destructive surroundings than ever known in the history of the world.

What can directly be called military surgery has never presented such an amount of material, including research, laboratory investigations and the study of all forms of wounds inflicted by every possible kind of missile — gas, mustard and poisoned bombs, liquid fire, disease-producing germs, everything conceivable for the destruction of human life. All of these conditions our surgeons, aided by the chemist and investigations in the laboratories, were able to treat promptly and successfully, as our medical journals so clearly indicate.

In collating the advances made in the department of military surgery medical journalism deserves great credit.

In the War Supplement of the ‹Index Medicus, 1914–17,› the classification of all papers and addresses on the subject is a marvel.

The energy exhibited by the bacteriologist and the ability to bring the laboratory up to the firing line aided immensely in obtaining methods of relief; however, it is impossible here to give any positive, concise summary of the methods adopted for the treatment of these differently classified wounds, under the care of the evacuation and base hospitals, but out of the vast amount of material there resulted unmistakable evidences of success.

X-ray work was of a superior quality, particularly when applied to the extremities, such as the long and small bones of the arms, hands, legs, feet and all irregular bones, as well as soft parts, muscles, vessels and nerves. The apparatus is now so perfect there is little risk in the development of X-ray burns.

Great progress in the treatment of wounds followed the Russo-Japanese War, yet no war ever took place when the ability to treat injuries of the kidneys, ureters and bladder was equal to that which was accomplished in this recent great conflict, regarding the immediate care of these cases. It may be stated here that the rich supply of X-ray apparatus enabled the surgeon to study with great exactness or to obtain such important information, after receipt of the patient in the evacuation hospital, as was hitherto unknown.

There is now a record of the application of modern dentistry, by employment of the X-ray and producing radiograms to be studied carefully, that not only is of great value in immediate treatment, but will continue to be in all reconstructive work.

There can be no question but that the wearing of steel helmets lessened scalp and skull wounds and injuries of the upper portion of the face and neck by a large percentage.

It is interesting to note that in shaping the latest patterns the designers had in mind even greater protection. The one objection was their weight.

It is a matter of great interest to note the similarity of wounds in connection with the American Civil War and the European War.

Shrapnel used extensively during the European War causes a wound very much like that of the Minié ball of the Civil War, but the bullet of the machine gun of to-day is not so destructive as that of the rifles used during the conflict between the North and the South.

Aside from this progress, to which we have referred, the study and treatment of tetanus became a very important subject. The first year of the war very rapidly developed the danger of immediate infection of the wounds, and a large percentage of the cases when they reached the base hospitals were in an infected, suppurative condition. In association with these wounds was also the development of cases of acute tetanus, largely thought due to the nature of the infective soil where the fighting occurred, and here, near the battle line, laboratory work was of great assistance. The consequence was that prophylactic treatment by use of the tetanus antitoxin serum, in all lacerated and dirty wounds, lessened the number of these cases very decidedly.

The British were slow in making use of this antitoxin. The American military surgeon had learned from civil life its great value and was at once prepared to employ it. Here credit should be given to the great State of New York in early establishing a State laboratory for the study and free distribution of this serum to its boards of health.

The one great department that can be classed as a division of military surgery is known as orthopedic or reconstructive work, and in the hospitals that were established by the United States government have been accomplished results in the restoration of the functions of various portions of the body that hitherto were deemed impossible.

Reconstructive occupational therapy in the study and treatment of lesions of the organic nervous system is apparently receiving a good deal of attention.

Shell shock is a new term, possibly to be followed by a better interpretation of this new lesion in war surgery, but its proper understanding and treatment is being worked out in a most admirable manner. There can be no doubt that men are seriously affected by the bursting and passing of shells and the firing of these high explosives. The system receives a shock that afterward manifests itself in various ways. The patient may become temporarily insane, his mentality receiving a severe shock in many forms. It may be only functional and disappears when surroundings are such as to restore his confidence, returning him to his former normal courage and ability to get control of himself. There were a good many of these cases, and great care had to be exercised that no injustice be done in their diagnosis and treatment.

The treatment of gunshot wounds of the face and jaws has attracted much attention. In the building up of the face, the nose, and especially that portion that relates to fractures of the upper and lower jaws, our military surgeons have recognized the aid of the up-to-date dentist.

During the entire time of the World War civil practice was quite entirely overshadowed, the study and treatment of wounds received in battle claiming the greater attention.

In the care of wounds it was early observed that prompt treatment was of great importance. The removal of all possible sources of infection, giving a clean incision in the soft parts, then bringing them together, resulted in excellent recoveries.

It was assumed that wounds passing beyond the eighth hour were in danger of infection and more serious complications, giving a prolonged and anxious line of treatment.

Free incision, when once the wound showed evidence of infection, care in removal of any material that might have been left behind, brought out different views as to irrigation, drainage and the use of antiseptics. There has been great discussion regarding the use of the latter, some surgeon writers coming to the conclusion that any sterile preparation — and keeping the part clean — was sufficient.

The Congress of American Surgeons and Clinical Surgeons was arranged with great care by its officers for 1918, and many surgeons connected with the armies abroad accepted invitations to prepare papers and discussions on the classification and treatment of wounds.

In consequence of the epidemic of influenza this meeting had to be abandoned, which was a great disappointment to all; however, the foreign delegates who did come visited a number of our larger cities, attended hastily called meetings and gave clinics, that, later, as they appeared in our medical journals, added greatly to our present literature on military surgery.

As has been stated, it is impossible in the space available to make any detailed report on what has come to be considered as the better treatment of all wounds; however, this much can be said: At dressing stations, so far as time and the wound will permit, such dressings should be applied as will enable the patient to reach the base hospital. More serious wounds are to be treated at the evacuation hospital, such as the control of hemorrhage, amputation that may be necessary, all wounds that can be, and time will allow, to have more permanent dressings, in order to transport distances to the base hospital with as little handling and disturbance of the dressings as possible. Here should be used prophylactic doses of the tetanus antitoxin in such wounds as seem to require it. On arrival of the wounded at the base hospital all cases to be carefully inspected, those found infected to have free incision, all necrosed tissues, or foreign substances, such as pieces of clothing, dirt, fragments of missiles, anything that may conduce to the spread of infection, removed, and bringing the wound into a better condition for immediate union. Also in these cases there enters the application of the drainage tube, and the beginning of the Carrel method of treatment, the Dakin antiseptic solution, the use of the newer antiseptics, such as dichloramin-T., chlorinated eucalyptol, chlorinated paraffin oil, aceiflavin and proflavin, brilliant green and other methods of antiseptic dressings. Wright's theory of thorough irrigation and the 20 per cent solution of picric acid in alcohol have been used with good success in the treatment of sepsis. In the cases of gas infection, or gas gangrene, emphasis is placed upon long and free incisions, amputations without any attempt at bringing the flaps together and also the use of the serum treatment. Keen's book on «Treatment of War Wounds» has afforded much valuable information.

In the treatment of convalescents it is very much to the credit of our government that the wounded were brought as near to their homes as possible, and one had but to notice the almost daily arrival of steamers to observe how faithfully this was being carried out.

Albert Vander Veer, M.D.

MILITARY TELEGRAPH, commonly applied to the use of telegraph wires in warfare as in the Civil War when a corps of engineers constructed temporary telegraph lines from the front to points in the rear of an army. In later years this system has been superseded by the heliograph (q.v.) and still later by wireless telegraphy and the use of flag signals commonly known as wig-wagging (q.v.).

MILITARY TENURE. See Tenure.

MILITARY TERMS. The numerous changes (strategically and technically) and advancements in the science and art of war brought forward many technical military terms, most of which are known and understood only by the military student. The following are the more important of such terms:

Advance Section.— The area of the service of the line of communication within which are situated the advance depots of ammunition, supplies, animals and material from which issues are made to divisional trains.

Aerial Mine.— A type of grenade, weighing as much as 200 pounds, used to beat down the enemy's defenses, destroying his sand bags and revetments, and cutting away wire entanglements and other obstacles. A smaller variety is known as the *winged torpedo*.

Alignment.— A straight line upon which several elements are formed, or are to be formed; or the dressing of several elements on the same line.

Ardois Signals.— A system of signaling in which a set of electric lanterns arranged vertically on a staff is used to send alphabetical signals. The globes of the lanterns are half red and half white and the letters are formed by the different combinations of the two colors.

Armed Tractor.— An armored motor car, resembling an enormous armadillo, capable of advancing over rough terrain. Its chief work is to locate the machine gunners and blow them out of their positions and thus save the advancing infantry.

Artificial Darkness.— A temporary expedient in dissimulation. It may be produced by the discharge of black powder, or by burning damp straw or setting fire to vegetation to form a heavy cloud of smoke. The darkness of night may be intensified by throwing the beam of a searchlight across and some way in front of the object to be screened.

Assembly Positions.— When compelled to withdraw, troops that have been actively engaged are usually obliged to fall back for several miles in deployed formation before efficient reorganization and assembly is possible. The assembly position must be far enough to the rear to enable the deployed lines to thoroughly free themselves from all contact with the enemy.

Azimuth Deviation.— In gunnery, the difference between the azimuths from the directing point of the battery to the centre of the target and to the point of splash at the instant the projectile strikes.

Barrage.— A wall of shell fire thrown against an advancing enemy with such regularity that troops cannot pierce it. It is employed to prevent an enemy's advance or retreat, or the bringing up of reinforcements. It is also used for the protection of troops advancing to the attack.

Base.— A place where the line of communication originates, where magazines of stores for the forces in the field are situated and maintained under direct military management and control and where the business of supplying these forces is located and organized under the military authorities; in fortification, the exterior side of the polygon; in ordnance, the protuberant rear portion of a gun between the knob of the cascabel and the base-ring; also the element on which the movement is regulated.

Battalion Reserves.— Reserves, usually consisting of at least one company, used to reinforce the firing when the whole of the supports have been thrown into it, to reinforce the firing line at the moment of the assault, to cover the advance of the firing line, to protect the flanks from counter-attack and, if possible, to bring an oblique or enfilading fire to bear on that portion of the enemy's position which is being attacked by the firing line.

Battle Sight.— The position of the rear sight on the service rifle when the leaf is laid down. This corresponds to a range of 547 yards.

Bayonet Combat.— The last resort, either in attack or defense, is the bayonet. The percentage of bayonet wounds, as compared with bullet or shrapnel wounds, is small, but a man wounded in bayonet combat seldom recovers. Hand grenades are much used in breaking up bayonet charges.

Bearing.— In map reading, the angle a line makes with the true north line is a true bearing. The angle a line makes with the magnetic north line is a magnetic bearing. The angle in both cases is measured from north by east and south.

Belgian Pits.— In trench warfare, small shallow pits, constructed in a number of rows, generally seven. The spaces between the pits are made impassable by pointed stakes and tripwire. Wire nooses are also anchored here and there.

Best Point of Entry.— In an approach against a fortification, the *blindest eye* of the work, or the particular spot in its firing-line where its own fire is least effective over its immediate foreground, or is least well supported by cross fire from adjacent works, or from artillery in the distance.

Bleiazid.— A high explosive used for detonations. Its force of detonation is twice as great as that of fulminate of mercury and it resists high temperatures.

Bomb Screen.— For protection against bombs and grenades a grille of wire netting is erected in front of the trenches and arranged at such a slope that the majority of grenades passing over the screen will also clear the trench.

Bracket.— In gunnery, a space in the direction of range, the limits of which are determined by firing. A target is said to be enclosed in a 100-yard bracket when, of two ranges differing from each other by 100 yards, one is over and the other is short of the target; also, the cheek or side of an ordnance carriage.

Burst Interval.— In gunnery, the distance in the plane of site from the point of burst to the target. It is given with a minus sign when it is between the gun and target, and with a plus sign when it is beyond the target.

Camouflage.— A blind or cover screening military movements and operations from the enemy air scouts, and other reconnoitering parties. The most practicable and convenient cover is made of small foliage-bearing trees and brush. Camouflage, in its fullest sense, is the art of varying the visibility of objects, and of deceiving as to their nature.

Clock-face Method.— In gunnery, a method employed to indicate the position of the target described in relation to a description point. In employing it, the clock-face must be imagined as hanging vertically, with its centre directly over the description point.

Close Billets.— Billets adopted when a greater state of readiness is required than is possible in ordinary billets. For this reason, tactical considerations invariably have precedence over considerations of comfort, and arms and units should never be mixed.

Coast Artillery Supports.— Small bodies of coast artillery or mobile troops assigned to the defense of the fortifications against attack by raiding parties; they are under the orders of the coast defense commanders.

Coefficient of Wind-pressure.— In gunnery and aeronautics, the numerical constant in the formula expressing the pressure of the wind against a stationary object or of the air resistance to a moving object.

Combat Practice.— In small arms firing, the prescribed firing at targets which simulate the appearance of an enemy under conditions approaching those found in war, and the application of this class of fire to tactical exercises.

Communication Trenches.— Those connecting fire trenches with the cover trenches and the cover trenches with any trenches (reserve) in rear where natural covered communication is impracticable. They are zigzagged to escape being enfiladed.

Cone of Dispersion.— In small arms firing, a term applied to the figure formed in space by the trajectories considered together of a series of shots fired by a body of soldiers at a common objective and with the same rear sight setting; also the elliptical shaped cone made by the dispersion of shrapnel balls when the shrapnel bursts in the air.

Convergence Difference.— If the guns of a battery be accurately laid for converging fire upon a target and the panoramic sights be then turned upon a common aiming point, the sight readings will be found to vary by differences which are for all practical purposes equal from gun to gun throughout the battery. This common difference is called the *convergence* difference.

Counter-trenches.— Trenches made against the besiegers, which consequently have their parapets turned against the enemy's approaches, and are enfiladed from several parts of the place on purpose to render them useless to the enemy if he should chance to come into possession of them.

Covering Position.— In the transport service, a position to be occupied by an advanced detachment of troops at such distance from the selected landing that neither anchorage, beach nor forming-up place is exposed to shell fire from the enemy's land forces.

Curtain Fire.— Another name for *barrage* or a zone of artillery, machine gun or trench weapon fire established for the purpose of preventing the passage of troops.

Curved Fire.— When a projectile is fired so as to just clear an interposing cover, and then descend upon the object, the line of fire being perpendicular or nearly so to the front of troops or works to be destroyed; fire with low muzzle velocity, the elevation not exceeding 540 mils, usually from howitzers.

Danger Angle.— The angle which the tangent to the trajectory at the point of splash makes with the plane containing the point of splash and parallel to the horizontal plane through the muzzle of the piece in the firing position. Also called *Angle of Splash*.

Danger Space.— The distance, in the plane of the slope considered, over which an object of a given height would be pierced by a given trajectory.

Deflection.— Generally the angle set off on the panoramic sight of the directing gun. It may or may not be the same for the other guns. In direct laying, it is such as is necessary to correct for wind, drift and the movement of the target; the deviation of a shot or ball from its true course; sometimes written *deflexure*.

Deflection Difference.— The common converging or diverging difference applied to guns other than the directing gun, necessary to bring them to bear on their proper portion of the target. The deflection difference for parallel fire is always equal to the parallax of the aiming point. It is positive if the aiming point is in front and negative if in rear.

Delaying Actions.— Actions in which the advance of the enemy is delayed as long as possible without imperiling the safe withdrawal of the delaying force; and, in which this force must hold its position for a time that is dependent upon conditions in other parts of the field or in the theatre of war.

Deployment.— An evolution by which a command extends its front; it may be partial, as when heads of columns form on the same line; or complete, as when a firing line is formed, with supports and reserves.

Depth Bomb.— A bomb designed for use against submarines and other submerged objects. Submarines, once seen below the surface, are pursued and destroyed by dropping *depth bombs* from the observing aircraft. Depth bombs are also known as *diving torpedoes.*

Diamond-hitch.— In animal transportation, the side packs are slung across the aparejo by the sling ropes and lashed on with the lash rope and cincha in the form of the *diamond-hitch*, the formation of which is accomplished by two packers, termed the "near" and "off" packers.

Dissimulation.— The production of targets less attractive to the enemy than those which would be offered by the undisguised works of the defender, and which are less likely to arouse the enemy's suspicion, while at the same time they conceal the true nature of the defenders' powers of offense.

Dressing Stations.— Stations established during combat by ambulance companies of the sanitary train in the immediate rear of the line of regimental aid stations, which are the places where all wounded unable to walk are collected from regimental aid stations by bearers of ambulance companies.

Echelon.— A body of troops is "in echelon" with reference to another body when it is more or less advanced and unmasks or uncovers the same, wholly or in part. Units so placed are called *echelons.* Sometimes used to designate the different elements of a tactical command.

Effectiveness of Fire.— The effectiveness of fire under battle conditions and in combat firing exercises is dependent upon the three factors, the percentage of hits made, the number of targets hit and the time of execution. The ultimate effect may be expressed synthetically by the number of enemies disabled or targets hit in a unit of time.

Elements.— The simplest of the distinct *isles of resistance.* They are generally made up of a small collection of trenches and barricades, and receive as a garrison a *complete unit*, from a squad to a platoon, having special orders to fit their location.

Energy of Recoil.— An expression for the work done in the recoil of a gun when fired. It may be reduced by decreasing the weight of the projectile, by decreasing the muzzle velocity or by increasing the weight of the gun and carriage.

Enfilading Battery.— A battery used for destroying the artillery and traverses, and silencing the fire of the defenses. Positions are chosen for the enfilading batteries from which the terrepleins of the faces can be swept throughout.

Evacuation Points.— In the sanitary service, the places at which the sick and wounded are transferred from the division to the lines of communications.

Examining Post.— A small detachment, under the command of an officer or a non-commissioned officer, stationed at some convenient point to examine strangers and to receive bearers of flags of truce brought in by the outguards or patrols.

Field Telephone.— A line of telephone set up and quickly transferred from place to place in the field of military operations, employed for transmitting information from various points to the station of the general officer commanding and for the distribution of orders emanating from said station.

Field Wireless.— Temporary wireless stations set up in the field of military operations to facilitate the transmission of orders, to gain knowledge of enemy movements and to communicate with aircraft acting under orders of the ground officer.

Files.— Two men, the front rank man and the corresponding man in the rear rank. The front rank man is the *file leader.* A file without a rear rank man is a *blank file.* The term *file* applies also to individual men in single rank formation and to a single mounted man in ranks.

Fire Control.— The exercise by a commander, over his unit or units, of that power which enables him to regulate the fire in obedience to his will. It pertains especially to the technicalities immediately involved in delivery of fire.

Fire Direction.— A general term embracing the various steps, including tactical disposition, which enables the commander of one or more fire units to bring an effective fire to bear upon the desired target at the proper time. It pertains especially to preparation of fire.

Fire Discipline.— The training of men so that they will instinctively carry out all orders of fire-unit commanders and in the absence of orders adjust their sights and fire with due regard to the tactical situation.

Fire Superiority.— Superior moral or physical fire effect as compared to that of the adversary. Fire superiority is implied if the assailant can advance or force back the defender.

Firing for Effect.— The fire delivered for the purpose of producing effect on the target. It usually follows immediately after adjustment and is delivered with the greatest rapidity consistent with proper laying of the guns.

Fixed Batteries.— The batteries containing the siege guns and mortars of the heaviest calibre and longest range, placed when possible in enfilading positions and delivering their fire within the interior slope of the face enfiladed.

Flight Commander.— In aeronautics, an officer who commands and leads a squadron of aircraft, executing orders of the ground officer as far as possible, being followed by the squadron.

Gas Attacks.— Attacks in which chlorine and other gases are brought up to the trench compressed in steel cylinders. These are dug into the bottom of the trench and connected with pipes leading over the parapet. When the valves of the cylinders are opened the gas escapes with a loud, hissing noise, mixes with the air and is carried by the wind to the opposing trenches, spreading out in a continuous cloud as it goes.

Gas Hemlet.— A defensive mask, usually referred to as the P. H. helmet or tube helmet, consisting of a flannelette bag which pulls over the entire head and which is chemically treated. It is fitted with a mouthpiece with a valve which is rubber covered, and when in use is gripped by the teeth. Inserted in the front are glass windows for the eyes. During the passage through the material of the helmet, the poisonous gas is absorbed by the chemicals.

Gas Warfare.— The use of poisonous and asphyxiating gases in attacking the enemy, either by emanation or by means of shells and grenades. The first requires a favorable breeze of about five miles per hour and there must be no rain. In the shells and grenades method of dissemination, shells and bombs are used containing liquid gas, or a substance which gives off irritant fumes.

Ground Section.— In gunnery, the zone of dispersion. In connection with the effective ranges of shrapnel balls it will be found that many balls impacting near the outer limit of a ground section are ineffective due to lack of man-killing energy.

Group of Posts.— Sub-sections organized by the commander within each section of an entrenched zone. The general duties of the commander are the same as those for an outpost commander.

Gun Squads.— Soldiers grouped for the purpose of making units for the operation and service of guns in battle and to facilitate their control and movement. Their habitual formation is in column.

Hairbrush Grenade.— A racket bomb used to demoralize the enemy, the noise created by its explosion being very great. It consists of a board about 12 inches long and 6 inches wide, cut down to the shape of a brush. On the large end of this is wired or tied a slab of wet gun cotton. In the centre of the slab is placed the dry primer or cone of guncotton with detonator and time fuse.

Head Cover.— A vertical shield of any material which protects the heads of the troops from fire. In fortification, any horizontal cover which may be provided above the plane of fire. It is advantageous only when the conditions of the foreground are such that the enemy cannot get close up.

Height of Burst.— The angle in mils which a line joining gun and the point of burst makes with the plane of site. The height of burst adopted for adjustment is one mil and for effect three mils.

High Explosive Shrapnel.— A shrapnel differing from the common shrapnel only in the substitution of an active for an inert matrix. The matrix surrounding the balls in a common shrapnel is resin and mono-nitro-naphthalene; in the high explosive shrapnel the matrix is tri-nitro-toluol, a high explosive. The fuse of the high explosive shrapnel, in so far as the time action is regulated, is the same as the field artillery 21-second combination fuse.

Holding Attack.— An attack for the purpose of holding the enemy to his position by offensive action in one part of the field while a decisive blow in the nature of an assault or of an enveloping or a turning movement is struck in another quarter.

Illuminating Grenade.— A contrivance, weighing about 14 ounces, attached to the muzzle of the ordinary service rifle. In projecting it into the air, the butt of the rifle is placed on the ground. A firing rod releases a parachute and ignites the illuminating substance — calcium carbide.

Incendiary Grenade.— A form of grenade designed to scatter molten metal upon bursting. The most effective of the kind contains the ingredients necessary for making the compound known as *thermit.*

Independent Cavalry.— Cavalry independent of the infantry divisions advancing behind it and under the sole orders of their own commander, who receives his instructions direct from the commander-in-chief. It is the chief means of providing the commander-in-chief with the information which he requires in order to dispose the whole of his force to the best advantage and with the greatest hope of success.

Interior Guards.— Police guards, guards of property, etc., who are liable to come in contact with the enemy.

Journal of Attack.— In actual siege operations, a daily record made by each engineer officer on duty in the trenches, of the amount of work done, the time required, the means of execution, etc., with any observations that may seem of value.

Journal of Defense.— A journal in which is kept by the commander of a place and the chiefs of engineers and of artillery, during war, in order of date, without blank or interlineation, all orders given or received, the manner in which they are executed, their results, and every event and circumstance of importance in the progress of the defense.

Jump of a Gun.— The increased angle of departure at which a projectile leaves a gun, after the gun has been truly leveled at the target or object to be struck.

Knuckle Knife.— In raids and trench work, a knife about nine inches long, ending in a handle that has openings for the four fingers to go through, thus serving as a "knuckle duster."

Lateral Communications.— Communications between the different portions of an army when moving from one common base by different roads toward an enemy, so that in case of a concentration being required on any particular point, instructions and orders can be readily carried out.

Liaison.— A French term signifying the connection or communication to be established between various officers or between various units and officers.

Line.— A formation in which the different elements are abreast of each other; the numbered organizations of an army in contradistinction to the guard or guards; the infantry, cavalry, artillery, etc., in contradistinction to the staff corps and departments; a picket line or side line; an imaginary limiting line in fencing; a trench or rampart; a general term applied to all combatant troops; a position occupied by troops, as a defensive line.

Line of Circumvallation.— An exterior line of works forming an unbroken line of entrenchments composed of the most simple elementary parts, as tenailles, redans, etc., with a slight profile; its chief object being to prevent succors of small detachments from slipping into the place.

Line of Communication.— The communication by rail, road and navigable waters between the army and its base or bases inclusive, together with the district through which it passes, within such limits as the commander-in-chief may determine.

Line of Countervallation.— The line of field works constructed in front of the camps, and on the side next to the besieged position, to defend the camps, parks and trains against any attacks which might be made by the besieged.

Listening Posts.— Sheltered positions in advance of a defensive line for the purpose of early detection of the enemy's movements. They are connected with the main line by a communicating trench or subterranean gallery.

Longitudinal Deviation.— In gunnery, the perpendicular distance (over or short) of the point of splash from the vertical plane passing through the centre of the target and perpendicular to the plane of direction.

Longitudinal Resistance.— In gunnery a strain or resistance produced by the longitudinal pull or elongation caused by the direct thrust of the pressure in the bore on the head of the block, and by the displacement in longitudinal direction caused by the pressures which act normally upon the interior and exterior of the jacket.

Lookout Posts.— Protected positions, usually located in the first line trenches, at points where good views may be obtained of the enemy's line. They are usually constructed on the right side of a traverse and in an excavation in the front wall of the trench.

Map Reading.— The art of forming a clear mental picture of the actual features of the ground by reading the characters representing the same on the map. To be able to do so, the scale and map distances of the map must be known.

Mean Radial Distance.— The mean radial distance of the shots from the centre of the group on the target. To determine it, find the point of mean impact, and measure the absolute distance of each shot from it. Divide the sum of these distances by the number of shots on the target.

Meeting Engagements.— Meeting engagements are characterized by the necessity for hasty reconnaissance, or the almost total absence of reconnaissance; by the necessity for rapid deployment frequently under fire; and usually by the absence of trenches or other artificial cover. These conditions give further advantages to the offensive. The whole situation will usually indicate beforehand the proper general action to be taken on meeting the enemy.

Meeting System of Convoys.— A system under which two sections of transport, one of which is loaded and the other unloaded, meet at some point half way between two stages, exchange their vehicles or transfer their loads, and then return to their respective stages.

Mil.— The unit of angular measure, 1–6400 part of a circle. The arc which subtends a mil at the centre of a circle is, for practical purposes, equal to 1–1000 of the radius. The arc and its tangent are nearly equal for angles not greater than 330 mils.

Military Order.— An authoritative direction, respecting the military service, issued by a military commander with a view to regulate the conduct of military persons, or control the movements or operations of individuals or organizations under his command.

Military Police.— Police whose duty is to enforce all police regulations in the theatre of operations and in mobilization and concentration camps. They protect the inhabitants of the country from pillage and violence and prevent excesses of all kinds; keep all roads clear; arrest all soldier and civilian employees absent without proper authority from their organizations; arrest all marauders; and are charged with relieving organizations from the care of prisoners of war and with their safe conduct.

Military Reconnaissance.— A survey or examination of a country made under the protection of an armed force. It is one of the most essential operations connected with the tactics of the field, and serves as the basis of every movement or combination which it may be proposed to make.

Military Vocabulary.— The technical terms applied to the organization, weapons, equipment, formations and duties of various arms. It is important that the military vocabulary in each unit of an army should be uniform as to its various terms, especially in regard to the indication and description of targets.

Motor Transport.— A constant and serviceable means of transport, for troops and materials. In conjunction with trailers it may be employed for any and all special purposes, embracing motor ambulances, ammunition-wagons, artillery and machine-guns, kitchens, searchlights and telegraphs, and cause a close union of the three arms of service. It greatly increases the efficiency of engineer troops, making possible the more rapid transportation of tools and materials, gasoline power plants, etc.

N-Square Law.— In aeronautics, an expression meaning that if, for example, only five machines were flying in sufficiently close formation to act in attack or defense simultaneously—that is to say, so that the enemy could not approach one without coming under fire of all — they (in formation) would be more than a match for any force of machines (of equal individual fighting value) that might attack singly up to the number of 25.

National Salute.— A salute of 21 guns. It is also the salute to a national flag. The salute to the Union, commemorative of the Declaration of Independence, and consisting of one gun for each State, is fired at noon on 4 July, at every post provided with suitable artillery.

Natural Point-blank.— The point at which the line of sight intersects the trajectory the second time; or, more practically speaking, it is that point which, being aimed at, is struck by the projectile.

Night Assault.— An assault undertaken in order to gain a point of support for further operations in daylight, to drive in an enemy's advanced troops, to secure an outpost position as a preliminary to an attack at dawn or to surprise an ill-trained, ill-disciplined or semi-civilized enemy.

Night Operations.— Movements undertaken to outmanœuvre an enemy; to avoid observation, particularly when the enemy is provided with aircraft; to pass over an area of ground which it has been found difficult or impossible to traverse in daylight; to continue or complete an attack begun before dark; and to effect a tactical surprise.

Nobel Lighter.— A lighter for hand grenades having a five-second fuse attached. It consists of two cardboard tubes, one fitting over the other. Inside the top end of the outer tube there is a layer of friction composition; fixed on the top end of the inner tube is a forked brass friction head, which is held in position by a safety pin fastened through both tubes. Inside the other end of the inner tube is a small copper band, into which the fuse is fitted.

Noizet System of Fortification.— A system embracing the teaching of the school of Metz and having no sensible departure from the views and method of Cormontaigne, excepting to introduce such modifications as would remedy some of the acknowledged defects of his method. The front planned by Noizet has been taken as an elementary exercise for instruction in the art of fortification for the cadets at the United States Military Academy at West Point.

Observation.— Watching the effect of fire on the target with a view to correction or verification of sighting, either by watching for the dust thrown up by bullets, or the behavior of the enemy.

Offensive Patrols.— That class of patrols made exterior to the line of outposts, with a view of gaining intelligence of the enemy's whereabouts. They are composed of larger bodies of men than defensive patrols. In aviation, these patrols go far beyond the lines and make invaluable reconnaissances.

Ordinary Billets.— Billets in which troops are lodged in houses or buildings at the rate of about one man to each three to four square yards of floor space. In agricultural districts, ordinary billets without subsistence can be provided at the rate of about 10 men per inhabitant.

Ordnance Depots.— The ordnance services on the lines of communications consist of ordnance depots, the personnel for which is found from one or more ordnance companies.

These depots are distributed at the base, advance base and at other localities on the lines of communications. Intermediate depots are also established as may be necessary. Ordnance depots contain all the necessary reserves of arms, ammunition, equipment, etc., exclusive of medical and veterinary stores.

Orientation.— In artillery, the determination of the east point of the compass, in taking bearings. The orientation of mortars is frequently tested and the setting of the azimuth indices corrected. A drawing is said to be oriented when so placed that its true meridian is parallel to the true meridian of the ground.

Outward Flank.— The extreme file on the right or left of a division, subdivision or section, according to the given front, when the battalion is at close or open column, and which is the farthest wheeling point from line into column, or from column into line.

Overhead Fire.— Fire directed over the heads of troops. Its object is to cover the advance of troops, to increase the fire effect on any particular portion of the enemy's lines and to cover the enemy communication trenches and prevent supports coming up.

Oversea Operations.— Operations undertaken with a view to (a) the establishment of a base for military operations either against the enemy's field armies or against a coast fortress, (b) the establishment of a flying naval base, or (c) raids against shipping, communications, etc.

Pack Transportation.— A division of animal transportation, in which the animal is the unit, and each can carry, on a conservative estimate, 300 pounds gross or 225 pounds net load. The great advantage of pack transportation is its mobility, and ability to go over rough country where wagons are impassable.

Panorama Sketch.— A sketch too extended to be viewed in its entirety at once, but is exhibited part at a time by being unrolled and passing continuously before the spectator. Panoramic sketches are made by means of panoramic cameras transported by aircraft or otherwise.

Parachute Grenade.— A percussion grenade whose body consists of a tin cylinder of explosive with a hemispherical head of larger diameter containing shrapnel bullets. A buffer cylinder passes through the body and projects, so as to produce the explosion slightly above ground. A parachute safety arrangement is attached to the head of the handle in order to prevent fragments flying to the rear on explosion, and also to cause the grenade to fall on its head.

Patrols.— Small detachments employed for a variety of purposes, the name of the detachment indicating its duty, as visiting, connecting, combat, exploring, reconnoitering, flanking, harassing, pursuing patrols, etc.

Permissible Explosives.— Explosives based variously upon ammonium nitrate, nitroglycerine and nitrostarch. They are poorly adapted for demolitions, but are peculiarly suitable for mining operations.

Photograph Officer.— In aviation, an officer in charge of the photographic lorry who is responsible for the photographic apparatus and the development of plates delivered by the observing aviators who have been aloft.

Picric Powders.— Powders consisting of pure picric acid, or that acid combined with a non-metallic base. They are non-sensitive to shock, unaffected by heat or cold, and in some forms by water, can be produced in a granular form or fused into solid shapes. Melinite, lyddite, ecrasite and shimose are of this class.

Pill-Box.— A slang term for a concrete and steel shelter and outpost defense, armed with machine guns as used by the Germans on the western front. It generally contained two main chambers and mounted from three to five machine guns in a bastion beyond these chambers. A stairway led to the top which might be used for observation purposes.

Plane of Site.— A plane containing the right line from the muzzle of the gun to the target, and a horizontal line perpendicular to the axis of the bore at the muzzle. It is sometimes called the *zero plane.*

Plunging Ricochet.— The description of *ricochet fire,* when the angle of fall is comprised between 6 degrees and 10 degrees. In this fire, the ball is given a small velocity, and the curve described is short and high.

Point Blank Range.— The distance from the muzzle of the piece to that point in the projectile's trajectory where it cuts the prolongation of the natural line of sight, a second time, the natural line of sight being horizontal..

Position of Deployment.— A place (preferably a large open space) near some landmark easily recognizable, where the whole of the infantry detailed for the attack can halt for a few minutes in order to make sure that all the units are present and can easily deploy for the attack.

Position in Readiness.— A position for action in which troops are placed where it is intended to resist the advance of the enemy in the immediate vicinity and the knowledge of his movements is not sufficiently definite to decide upon a plan of action.

Potence.— Troops are ranged *en potence* by breaking a straight line, and throwing a certain proportion of it either forward or backward, from the right or left, according to the circumstances, for the purpose of securing that line. An army may be posted *en potence* by means of a village, a river or a wood.

Practice Marches.— A part of the field training of troops having in view the hardening of the men and animals and the instruction of officers and men in duties incident to a campaign, marching, camping, cooking, etc., and the principles of tactics, including the services of information and security.

Profiling.— An operation by the construction of field works which consists in erecting at proper points along the subcrests wooden *profiles* which give the form of the parapets at those points, and which guide the workmen in the construction of the works.

Progressive Powder.— A gunpowder made so that it burns slowly until the projectile moves, and then with increasing, or progressive rapidity, to avoid the extreme pressure caused by the explosion of powders in which the combustion is instantaneous.

Protective Cavalry.— The first line of security until the opposing infantry columns get within striking distance of each other. It covers the advance of the army or group of divisions to which it is attached, to prevent the enemy obtaining information as to the disposition of the force which it is covering, and to allow the force tactical freedom of action.

Protective Patrols.— Patrols detailed for the immediate protection of the force and to prevent the enemy's scouts and patrols from attempting to penetrate the screen and gain the fullest information as to the advancing infantry.

Provost Guards.— Guards used in the absence of military police, generally in conjunction with the civil authorities at or near large posts or encampments, to preserve order among the soldiers beyond the interior guard.

Quadrant.— In gunnery, an instrument, generally made of brass, for ascertaining or adjusting the elevation of ordnance, particularly mortars, which have no tangent scale. It is graduated into degrees and parts of a degree, having a movable index, with a spirit level and vernier attached to it.

Quarter Guard.— A guard mounted in camp, immediately on the arrival of each corps on its ground. It is placed in front of the centre of the camp, at about 80 paces from it, and is charged with special duties.

Quarter-sights.— In gunnery, division marked on the upper quarters of the base-ring, commencing where it would be intersected by a plane parallel to the axis of the piece, and tangent to the upper surface of the trunnions. These sights are used for giving elevations up to 3 degrees.

Radian.— A unit of angular measurement. The true mil is a thousandth part of a radian, or practically 1-1570 part of a right angle.

Rafale.— A variety of artillery and infantry fire which has for its object the production of a paralyzing, instantaneous effect produced by suddenly delivered, very violent gusts of fire of short duration, separated by more or less prolonged intervals of calm. Rafale in French literally means "squall."

Rally.— The rapid grouping behind a leader of the various elements of a command without reference to their previous situation or formation.

Range-azimuth Table.— A table of ranges and the corresponding azimuths from a gun to points in the centre of the main ship channel or channels. It is kept at the gun and used for firing without the use of range-finding apparatus.

Range Officer.— In coast artillery, the officer in charge of the position finding equipment and the range section of the battery command. His station is at the battery plotting room and he is responsible to the battery commander for the condition of the material and for the efficiency of the personnel under his charge; an officer charged with the police and care of a target range and its accessories.

Record Practice.— In small-arms firing, a practice to afford the soldier an object lesson of his progress, and to obtain a record by means of which the soldier may be graded in awarding insignia and increased pay.

Re-entering Place of Arms.— In fortification, an enlargement of the covered-way, at the re-entering angles of the counterscarp; this space is formed by setting off demi-gorges of 30 yards (more or less) and making the spaces form angles of 100 degrees with the adjoining branches of the covered way.

Relief.— The height of the interior crest of a parapet above the bottom of the trench; or, the length of time that men have to work before being relieved; or, a number of men who work or are on duty for a given length of time.

Rendezvous.— Place to which the columns of the line of communication are sent where they are met by agents of the trains and conducted to refilling points.

Representative Fraction.— In military map reading, a fraction whose numerator bears to the denominator the same proportion that a distance on the map bears to the distance on the ground it represents. The numerator must always be 1, and the denominator is expressed in similar units.

Ring-gauge.— A circular steel gauge used in inspecting shot and shells. They are made of two sizes for each calibre, the larger being a trifle more and the smaller a trifle less in diameter than the true calibre of the projectile. All shot received must pass through the larger gauge, but are rejected if they pass through the smaller.

Rolling Fire.— A discharge of musketry by soldiers in line, in quick succession, and in the order in which they stand; also a fire where the axis of the piece is parallel or nearly so, with the ground or water, and the projectile rebounds over the surface in a succession of ricochets.

Route Marches.— Marches used in peace to conduct a body of troops from one station or post to another. In time of war they are used for the purpose of assembling the fractions of an army on its base of operations of conducting troops through a country where there is no enemy.

Russian Sap.— A gallery without sheathing, the top of which is cut in the form of an arch. The earth is carried to the rear as in the case of the deep sap. Ventilation holes are arranged here and there, permitting the location of the arched roof in relation to the surface of the earth as the work progresses.

Salient.— In fortification, that which points outward from the interior of any work. For example, the central angle of a bastion, pointing toward the enemy, is a salient angle. Also, in map reading, a projection from the side of a hill or mountain, running out and down from the main feature.

Salvo.— Concentrated fire from a greater or less number of pieces of artillery. Salvos, corresponding to volleys of musketry, are frequently fired by way of salutes over the graves of officers at the time of burial.

Sanitary Service.— The service embracing the institution of all practicable sanitary measures to the end that the fighting forces suffer no depletion in strength, the temporary care and professional treatment of the sick and wounded and their transportation and the supply of the necessary sanitary equipment.

Sanitary Train.— A train including all vehicles, animals, personnel and reserve sanitary material, not attached to organizations, employed in collecting and caring for the sick and wounded of the division pending their evacuation by the line of communication.

Searching Fire.— Searching is the term applied to collective fire when the depth of its dispersion over a beaten zone is increased by the use of combined sights.

Searchlights.— Important elements of the defense in a coast defense command. The standard service searchlights are 60-inch. Depending upon their tactical use, they are classified as searching or as illuminating lights, and, depending upon their assignment, as fort, fire or mine searchlights.

Second Line.— The line of fire trenches, with the covering fire trenches, support trenches, support dug-outs (an exact duplication of the front line system) far enough behind the front line that in the event of the first system being taken, the second line is ready to be taken up by the troops driven out of the front line, and receive the support of troops lying in brigade or divisional reserve.

Secondary Bases.— Bases required, as an army advances, to enable it to have its supplies at hand. These bases, which should present the same qualities as does the original base, are usually established by detached bodies of troops, or by the reinforcements sent forward, so that the army will not be delayed in its onward movement.

Sector.— The joining together of several supporting points under the same commander is called a sector. It is generally held by a division, and is divided into *sub-sectors* of brigades and regiments. The force assigned to defend a sector has its own separate reserve district from the reserves of the supporting points.

Sector of Explosion.— At the moment a gun is fired, a spherical sector of fire is formed in front of the piece, whose extremity presses against the bottom of the bore, while the external portion of it terminates in the air, which this sector compresses and drives in every direction.

Sector Without Fire.— That space exterior to a work which is not defended by the direct fire of the adjacent faces. The space is included between lines drawn through a salient, perpendicular to the faces.

Sentry Over Arms.— A sentry mounted at the picket post to watch for any signals from the videttes or cossack posts, or in the case of infantry sentries or sentry groups, and to guard the picket against surprise.

Sentry Squad.— A squad posted in observation at an indicated point. It posts a double sentinel in observation, the remaining men resting near by and furnishing the reliefs of sentinels. In some cases it nay be required to furnish a patrol.

Service Colors and Standards.— National colors or standards made of bunting or other suitable material, but in all other respects similar to the silken national colors or standards. These colors and standards are for use at drills and on marches, and on all service other than battles, campaigns and occasions of ceremony.

Service of the Interior.— The function of the service of the interior, in time of war, is to supply the commander of the field forces with the means necessary for the accomplishment of his mission. This service is carried on by the bureau chiefs, department commanders, and in certain instances by commanders of concentration camps and of ports of embarkation. Their respective operations are directed and co-ordinated by the Secretary of War through the medium of the chief of staff.

Sheaf Ranging.— In coast artillery, the firing of two or more guns at the same instant with their range settings differing by equal increments and increased or decreased from the right by the specified increment in yards, observing the relative positions of targets and splashes, and making corrections from these observations.

Shelter Recess.— In fire-trenches made in favorable ground, a forward burrow, made by the individual rifleman, into the interior slope at the level of the firing step, in which he can lie in safety and at full length when not on duty at the firing point.

Shot Group.— Owing to different well-known causes the variations in the trajectory are such that in a series of shots fired at a target, no two shots will strike in the same spot, the hits being arranged in a certain diagram called the *shot group*, the size of which varies with the skill of those firing. Good shots will make a small group and poor shots a large one.

Sniperscope.— A device by the use of which a soldier can both aim and fire his piece at an object in front without exposing himself above the parapet.

Spade Warfare.— War or hostilities carried on from trenches and underground constructions. The spade has become a main feature in land warfare, since it has become necessary to get down into the earth to seek cover against the destructive effects of machine-guns, rapid-fire guns and other modern firearms.

Sprengle Explosives.— A class of explosives consisting of separate constituents, each non-explosive, which are combined at the moment of use. The most common is *rack-a-rock*, which consists of chlorate of potash a dry crystalline substance, and nitrobenzol, a liquid.

Stokes Trench Mortar.— A light mortar, weighing 105 pounds, made in three sections (the barrel, the mount and base plate) to ensure easy transportation to the front line trenches. It projects a bomb 3 inches in diameter which weighs 11 pounds and is loaded from the muzzle of the gun or mortar. The bomb slides down the barrel and when it strikes the bottom it is fired automatically.

Supervision Trenches.— Trenches to facilitate the movement of the troops, general supervision of same and to afford more shelter, freer movement and for accommodation of any additional men who are necessarily required when an assault is intended.

Supply Columns.— A part of the supply service for troops in campaign. Line of communications supply columns (usually auto-trucks or tractors with wagons) are dispatched to a rendezvous point, where they are met by an agent of the commander of the field forces and conducted to distributing points. When it is possible to do so, the supply columns go to the actual distributing points.

Supply Train.— A train including all vehicles, animals and personnel employed in transporting the divisional ration and grain reserve, or in bringing up the same from the refilling points to the distributing point. To it may also be attached herds of beef cattle, remounts, etc.

Tables of Occasions.— Tables showing by whom and on what occasions each article of uniform of the United States is worn; they also show the various articles of uniform and equipment — by whom, when and how worn.

Tables of Organization.— The details of organization, the amounts and kinds of transportation and the factors on which the allowance of transportation is based are fixed in the tables of organization United States army.

Tactical Decisive Points.— Points on a field of battle which, when occupied by an army, will enable it to make an attack on the enemy whose success would be decisive on the issue of the engagement.

Tactical Pursuit.— Pursuit directed at a flying enemy with a view to directly harassing him, causing him as much loss as possible and maintaining the loss of morale which may have such important consequences.

Tactics of Position.— That element of tactics or strategy of the battle-field which depends largely on the moral energy of the commander-in-chief for accomplishment.

Target Designation.— It is sometimes necessary, where a target is indistinct, to use what are called "auxiliary points" for target designation; and in this case the method is resorted to of giving the direction of the point to be fired upon from this auxiliary point. In giving this direction the notations on the clock face are used as in determining the direction of the wind on a target range.

Teamwork.— The work and accomplishment of a number of persons or soldiers associated together. The comparatively wide fronts of deployed units increase the difficulties of control. The success of the whole depends largely upon how well each subordinate co-ordinates his work with the general plan.

Theatre of Operations.— The whole area of land or sea in which fighting may be expected, or in which the movements of troops, etc., are liable to interruption or interference on the part of the enemy.

Thermit.— A compound of powdered aluminum and oxide of iron successfully used in incendiary projectiles. When ignited the heat given off is sufficient to melt the free iron.

Tin Cups.— Cups used with heavy breech-loading guns, which serve, in conjunction with the vent piece, to seal more effectually the powder-chamber, and to prevent the escape of gas, which is very destructive to the angular face of the vent piece.

Tower Forts.— Towers employed either as isolated forts or combined in a system of detached works for covering a space to their rear for an entrenched camp. They have several tiers of covered fire for artillery and musketry, and an open battery on top.

Traveling Trunnion-beds.— Contrivances for the purpose of distributing the load more equally over the gun-carriage. On the upper surface of the cheeks, near the rear ends, are placed two projecting bolts which, with the curve of the cheeks, form resting places for the trunnions, when the piece is in position for transportation.

Traversing.— Sketching by means of a continuous series of measured straight lines, the direction or bearing of which is taken with a compass at each change of direction. These lines are called *traverse* lines, and the sketcher must pace actually along these lines. The detail is sketched by means of offsets or cross-bearings.

Traversing-gear.— An automatic traversing apparatus, in machine-guns, by which a limited angular movement in a horizontal plane may be given. Elevating or depressing the gun does not interfere with the lateral traverse.

Trench-dump.— A convenient spot or place selected by whosoever may be commanding that particular sector of trench to which carrying parties bring up the *trench stores* during the night in order to have them ready for distribution in the morning.

Trip.— A useful trick in bayonet fighting. It is performed when in close grips with an opponent, by leaning forward and pushing him backwards, so as to cause him to throw his weight on one foot, at the same time deftly and quickly jerking his other foot upwards. This will throw him on his back at once.

Tripping Piece.— A part of the firing mechanism in quick firing ordnance, being a flat piece of steel, fitted over a stud at the rear of the striker, and kept pressed downwards by a flat spring. It has a shoulder for the smaller cam-lug on the inner end of the firing lever to engage with in order to cock the striker.

Triton.— An explosive made by the successive nitration of toluene, a coal-tar derivative. It is a neutral compound, very stable, of great strength, yet highly insensitive. It is pressed into blocks under high pressure, the insensitiveness of the explosive increasing with its density. Also written *trinitrotoluene*, *trinitrotoluol* and *trotol*; frequently abbreviated as TNT.

Very Lights.— Lights used to signal between aeroplanes or stations or between the ground and aeroplanes, when a code is prearranged; a flare for illuminating the enemy's position.

View of a Place.— A reconnaissance of a fortified town, its situation, the nature of the country about it, as hills, valleys, rivers, marshes, woods, hedges, etc., taken in order to judge of the most convenient place for opening the trenches, and carrying out the approaches.

Visiting Patrols.— Patrols detailed to keep up communication with the pickets, the supports on either flank and the reserve (if any). They also patrol any ground lying between the pickets and supports, which cannot be observed by either.

Warning Calls.— The class of calls comprising first call, guard mounting, full dress, overcoats, drill, stable, water and boots and saddles, all preceding the *assembly* by such interval as may be prescribed by the commanding officer.

Wheel Transportation.— A division of animal transportation, in which the wagon is the unit, and each animal can haul, on a conservative estimate, 1,200 pounds gross or 700 pounds net load. Wagon transportation should always be used unless the country is impracticable or the rate of march too rapid for wheels.

Wind Component Indicator.— In artillery and gunnery, a device for determining the wind reference numbers to be used on the range and deflection boards and to indicate the numbers to the operators of these boards.

Wing Traverses.— In fortification, where the approach is exposed to an enfilading and a slant reverse fire, and does not admit of a change of direction to avoid these wing traverses are erected across the line of trench to cover an enfilading view.

Wire Company.— The field signal organization used by the commander of a division for establishing and maintaining those tactical lines of information which radiate from division headquarters, and which serve, in general, to connect these headquarters with the major subordinate units.

Zero of a Rifle.— That reading of the wind gauge necessary to overcome the drift of a rifle at a particular range. All allowances for wind should be calculated from this reading.

Zone Energy.— A mode of expression in artillery, whereby the relative power of different guns as armor-piercers is estimated, viz., by the number of foot-tons per inch of the shot's circumference. At the muzzle of each gun, this power is a maximum.

Zone of Operations.— The strip of territory which contains the lines of operations, or lines on which an army advances, between the base and the ulterior object.

The foregoing terms or definitions have been officially approved by the United States War Department. Consult Farrow's Dictionary of Military Terms (New York 1918).

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MILITARY TERRITORIES OF FRENCH SUDAN, former designation applied to the French Sudan, now known as the colonies of the Upper Senegal and Niger and the Military Territory of the Niger. Extensive changes in the administration of the governmental affairs of the region were inaugurated in the period from 1895–1905. See French Sudan; French West Africa; Niger, Military Territory of; Upper Senegal and Niger.

MILITARY TRANSPORTATION. In wheel transportation the wagon is the unit, and each animal can haul, on a conservative estimate, 1,200 pounds gross or 700 pounds net load. In pack transportation the animal is the unit, and each can carry, also a conservative estimate, 300 pounds gross or 225 pounds net load. A given quantity of freight carried on packs requires three times as many animals as would be necessary to carry it on wheels. The larger number of animals means a proportionate increase of the forage to be provided and in the labor of feeding, shoeing, etc. If, however, the country and season are favorable for grazing, the pack mule will get on without any forage, while the draft mule cannot. Other disadvantages of pack service are that packages must be limited in size and weight much more closely than for wagons; long articles, as tent poles, cannot conveniently be carried except by special construction, and loading of pack cargoes is an expert service which must be performed by a few trained men, while loading of wagons is work in which all can participate.

The great advantage of pack transportation is its mobility, and this consideration is often paramount. A good pack train, well handled, can make two miles to one of the best wagon trains on good roads and more on bad ones, and can besides go where there are no roads and where the country is so rough that roads could hardly be made and wagons could not pass them if they were made.

Wagon transportation should be used unless the country is impracticable or the rate of march too rapid for wheels. The permanent pack train should be limited to the probable requirements of rapidly moving columns, and in those baggage, etc., should be kept down to an absolute minimum. When great difficulties of wagon transportation are foreseen the draft mules should be broken to pack service and enough aparejos carried in the train so that in case the wagons must be abandoned one-fourth to one-third of the loads may be placed on the mules and the march continued. The combination of harness and pack saddle which naturally suggests itself in this connection is not practicable. Such a combination would make a very poor harness and a worse pack saddle.

The mule is the standard draft and pack animal of the United States service. He can best be described and understood by noting his points of difference from the horse, which he resembles very closely. The points of difference in conformation are mainly larger, thicker head, longer ears and smaller feet, larger girth, shorter legs and longer body. The relative disposition of bones and their angles are the same as for the horse.

Pack Saddles.— The adopted pack saddle is of the Spanish type, and is commonly called by its Spanish name, aparejo. Its principal parts are the body, the cover, the cincha and the crupper. These parts are subdivisions, which are less important. The accesssories added to the above to make the aparejo complete are the corona, the blanket, the lash rope with its cincha, the sling ropes, the lair ropes and the mantas or pack covers.

The body of the aparejo consists of two pieces of heavy leather 24 inches wide by 58, 60 or 62 inches long, sewed together at the edges and across the middle of the length, forming two pouches, into which moss or hay is stuffed to form pads fitting the contour of the animal on either side of the backbone. In the American form the pads are given a peculiar elastic stiffness by means of ribs of wood or metal extending from a saddle piece at the top of each pouch to a boot piece at the bottom. These ribs are stiffer at the front and more flexible at the back, varying uniformly between. They convert each pad into an elastic lever, by which the pull of the cincha on the bottom acts to raise the aparejo and its load from the backbone, while the stuffing distributes the load uniformly over a large space on the ribs. The stuffing is introduced through a handhole in the middle of the underside of each pad, through which it is always accessible, and the finest art of the packer consists in fitting the pads to the shape of the particular animal which is to carry the aparejo, and keeping them so regardless of changes in the animal's condition by shifting, removing or renewing the stuffing. If a bunch rises on the animal it can be worked down by taking out stuffing immediately over it so as to take off the pressure at that point. Determine the proper point by wetting the top of the bunch and laying the aparejo on the mule. Aparejos and mules are numbered and the same pack is always on the same mule.

Animal Power.— The capacity of an animal to exert a tractive effort decreases as speed and time increase. As a basis, it may be assumed that an average draft mule can pull on a level 80 pounds at 2½ miles an hour for 10 hours every day, or, in other words, can pull 80 pounds over 25 miles of average level roads every day. If a pull of 160 pounds is required it can be made over 12½ miles a day only, the lesser distance being covered by a slower gait or longer rests, or, as is usually the case, partly by each. An animal can exert 2½ times the normal pull for a few minutes at a time and five times for a few seconds, provided in each case the demand is not repeated too frequently.

The load which can be hauled on any pull depends mainly on the kind and condition of the road and a little on the wagon, especially as to width of tire and size of wheels. For the standard army wagon and on a level average dirt road in good condition the load corresponding to 80 pounds standard pull may be taken at 1,000 pounds per animal. Of this, 300 pounds will be wagon, leaving 700 pounds net freight. Any reduction of this load to lessen the pull must come out of the 700 pounds. To reduce the pull to 40 pounds, 500 pounds must be taken from the freight, leaving 200 pounds only to be hauled. This 200 pounds pulled over 25 miles would equal 5,000 pounds pulled over 1 mile, while if the full load of 700 pounds is hauled over 12½ miles, which can be done with the same effort, the result equals 700 × 12½ = 8,750 pounds hauled 1 mile. If the length of the march is fixed, the animal can be relieved only by reducing the pull; otherwise it is better to relieve them by shortening the march.

On hilly roads there is no traction on the down grades and an increased gait is usually taken without appreciable extra exertion. This saves time, which may be spent in rests, allowing greater effort on the up grades. Up to 8 per cent grade, the load can be retained by reducing the distance. Up to 3 per cent grade, the distance can be maintained by reducing the pull. Above 8 per cent, both pull and distance must be reduced. The reduction of pull may be accomplished by removing part of the freight, by doubling up teams or by putting men on drag ropes.

Motor Transportation.—The company commander of an organization equipped with motor transportation is responsible for everything connected with its operation and maintenance. He formulates rules for the proper handling of the vehicles on the road and in camp or garrison and sees that the same are rigidly enforced. He establishes the division of responsibility with reference to operation, repairs and upkeep of the mechanical equipment of his company and sees that each member is thoroughly familiar therewith. He personally sees that all motor governors are properly sealed and keeps the sealing tool in his personal possession. He keeps accurate check on all gasoline, lubricating supplies, tools and spare parts. It is a favorite practice to use gasoline for many purposes except fuel. Motor parts, being high priced and readily salable, can only with difficulty be protected against theft.

In organization supplied wholly or in part with motor transportation a mechanic or mechanics are designated to assist in the repair of vehicles. In the telegraph company five mechanics are provided; a chief mechanic and one for assignment to each station, if desired. The chief mechanic, assisted by the other mechanics, has general supervision over the mechanism of the motor vehicle equipment, as well as the detailed repair work. He is in charge of the company repair outfit and utilizes it for the above purpose as necessity requires. He sees that the assistant mechanics are qualified and if necessary instructs them.

Chiefs of section are responsible for the proper operation and maintenance of the motor vehicles under their direct supervision. This especially applies when, as will frequently happen, the section is operating detached. In this case a mechanic, if available, should always be assigned to duty with the section.

The duties of the driver include the keeping of his assigned vehicle and its equipment in proper repair and working order. He is required to be familiar with the mechanism of his vehicle and its proper operation. Repair work performed by drivers is limited to that class designated as minor repair. Work on the motor, ignition and lighting system, or on the interior mechanism of running parts should be performed normally under direct supervision and orders of the chief mechanic or one of his assistants. Drivers are responsible for proper lubrication at all times and promptly report any defect noted or repair needed. Each is responsible that the vehicle under his charge is not subjected to abuse of any kind and that all regulations in force regarding operation and maintenance are properly observed.

Field trucks furnished organizations by the quartermaster corps are of standard make and are normally equipped with the war body. The inside dimensions of this body are as follows:

	Length, feet	Width		Depth, feet
		Feet	Inches	
One and one-half ton...	10	5	1	2
Three-ton............	12	6	6	2

See ARMY TRANSPORT SERVICE.

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MILITARY TRIBUNALS. See LAW, MILITARY.

MILITARY UNIFORMS. See UNIFORMS.

MILITCHEVITCH, Djakov Milam, Serbian author and ethnologist: b. Ripany, 4 June 1831; d. Belgrade, 1908. H concluded his theological education in 1850, entered the service of the state in 1852 and in 1861 he became secretary to the Minister of Education. He edited the periodical *Skola* in 1868–76, in addition to his official duties; and in 1886 was appointed librarian at the National Library of Belgrade. He ranked as one of the foremost Serbian scholars of his time. He wrote ‘History of Pedagogy’ (1871); ‘The Principality of Serbia’ (1876); ‘Life of the Serbian Peasant’ (1867–77); ‘Lives and Works of Illustrious Men’ (1867–79); ‘The Kingdom of Serbia’ (1884); ‘Biography of Famous Serbians of Modern Times’ (1888), etc.

MILITIA. The World War has greatly enlarged the conception of national military power. Militia from the earliest period has signified the manhood power of a nation, available for military purposes (and also, in a restricted sense, the enrolled volunteers from that body, who might, under sanction of law, be locally organized), as distinguished from such regular governmental military force, as a nation might maintain. Strong governments have maintained large, regular armies, the larger, the surer to strike aggressively; while republics have been prone to neglect the creation of armies until some necessity drove them to act for defense.

The advance of civilization found the entire man power of the nations of the world, in 1918, organized on military lines, some from preconceived ideas, some from necessity, and the nations becoming exponents of universal military training and service. What the war sequel will be is a fruitful theme for thought.

When the Constitution of the United States was adopted, the term militia had a definite meaning. By that instrument Congress obtained power to «provide for organizing, arming and disciplining the militia, and for governing such part of them as may be employed in the service of the United States. . . .» The Constitution also created the President «Commander-in-Chief of the Army and Navy of the United States, and of the militia of the several States when called into the actual service of the United States.» The Articles of Confederation had provided, «that every State shall always keep a well regulated and disciplined militia, sufficiently armed and accoutered, etc.» When the colonies united against the mother country they joined their quotas of volunteers from the militia, and with them fought the battles of the Revolution; and 80 years later the great Civil War was fought by militia, using that term in the sense which the government had adopted. By the Act of Congress passed in 1792, the first exercise of its power, the militia was defined to be all male citizens of the United States between the ages of 18 and 45 years, excepting certain specified exempt classes. The term thus used by our original lawmakers, with apparent positiveness as to its meaning and as to its function, was a natural result of the following facts.

English Militia.— As early as the time of Alfred the Great, the division and organization of society in England comprised the enrolment of the people in bands or companies, commanded by a leader, who was elected in the folkmotes, and called ealdorman or earl, and whose authority extended over the county. «By the Anglo-Saxon laws, or rather by one of the primary and indispensable conditions of political society, every freeholder, if not every free man, was bound to defend his country against hostile invasion.» Every 10 families, as far as convenient those related to each other, formed a tithing, commanded by the «borsholder» in his military capacity; 10 tithings formed a hundred, several of these forming a trything, or riding, as the word has been perpetuated in Yorkshire. Three public burdens, the *trinoda necessitas,* were imposed upon the citizen; to serve under arms, to repair and construct fortresses and to make and repair roads and bridges. The Norman Conquest was the means of creating an army made up of bands which attended the king under the command of their immediate lords by «knight service,» but that in no way changed the fundamental character of the militia. It was enacted by Henry II (1181, The Assize of Arms) with the consent of Parliament, that every freeman, according to the value of his estate or movables, should hold himself constantly furnished with suitable arms and equipments, the poorest having to provide himself with a «wambais» or linen coat stuffed with cotton, and a lance. In the time of Edward I (1275) the Statute of Winchester defined these requirements more clearly. «Every man between the ages of 15 and 60 was assessed and sworn to keep armour according to the value of his lands and goods, a hauberk and iron breastplate, a sword, a knife and a horse. For smaller property less expensive arms were required and these provisions were enforced by semiannual inspections by constables chosen in every 100.» From the earliest times the high constable of the county, or sheriff, was the officer by whose authority the citizens were called out, either to drive off predatory bands of robbers, or to assist him when he was in the performance of any duty required by the courts of law. When thus called out for the latter purpose, the body was known as the *posse comitatus*, or power of the county, and to this day the same power is lodged in our office of sheriff and is the ultimate resort of the county officer charged with legal process. The constitutional military force of the kingdom consisted, therefore, of the feudal troops and the *posse comitatus*. But the latter could not be marched out of the kingdom, nor yet out of their shire, except in case of invasion. The sheriff was also charged with the same duty of calling out the militia when the citizens were organized in pursuance of parliamentary enactments, but later, when the kings considered themselves to be in need of troops more under their immediate control, he was superseded by commissioners of array, although his authority remained unaltered as to summoning assistance for local duties. Prior to the reign of Elizabeth, lords lieutenant in the several counties were appointed by the Crown to marshal the military forces. The people were always exceedingly jealous of their rights, and as a nation insisted more upon pursuing their home labors than upon conquests and achieving glory, and one of the earliest records of this spirit is the enactment in the time of Edward III, made as a restraint upon the infractions of the rights of the people, that no man shall be obliged to equip himself except as has been the custom, and shall not be obliged to leave his shire except when necessity require it for the defense of the realm. Conscriptions and levies were resorted to at times, but were tolerated by the people only when their love for the government exceeded the bounds of resistance or revolution. The Civil War of 1642, the result of which was the execution of Charles I, was precipitated and protracted in part by the militia question. The right of the king, as chief executive of the nation, to call the militia into service in time of need was undoubted, but through the natural jealousy and distrust of Parliament, the power of the king was sought to be curtailed by making the office of lord lieutenant irrevocable for two years and giving those offices to the persons approved by Parliament. For six years this was one of the main topics of contention in the wars and negotiations which resulted in the establishment of the Commonwealth. The result of the war was to put England under the subjection of Cromwell and his army, and ultimately to fill the people with a great detestation of a permanent military establishment, and the whole course of subsequent legislation upon soldiery was directed with care to avoid the dangers of a standing army. The Restoration of 1660 was finally accomplished through the militia of England. To epitomize Macaulay's statement: «It was an exciting time,» the flame of civil war was actually rekindled, the nobility put forth their best energies to assemble and train the militia, and train bands were held ready to march in every county. The popular feeling and strength were too great to be disregarded; the old army of 50,000 men was humored as well as intimidated into accepting the unmistakable desire of the nation, and it saw itself destroyed, without striking a blow, looking sullenly on the triumphal entry of Charles II into London, while the militia invested the country with a strength they dared not measure. A force of upward of 120,000 men had been organized to act in this great emergency.

Shortly after the Restoration, the Parliament, filled with the idea of how important as well as how trustworthy the militia was, passed a bill organizing it. A horseman was required to be provided, equipped and paid for by every one having an income of £500 a year derived from lands or £6,000 of personal property. And every one whose income or possession was one-tenth of those amounts was charged with the equipment and pay of a pikeman or musketeer, and those of less estate were obliged to combine in furnishing horse or foot soldiers. The size of the body of soldiery thus created was estimated at 130,000 men. For a time, this force became a useful and serviceable body, but the influence of the Crown was not lent to perfecting it. The king's desires were rather to obtain possession of any army that could be used to do his bidding. James II was met by the jealousy of Parliament just as Charles I had been. Of a religion that was hated by the mass of the people, and repeatedly thrusting men who were tools of the Crown into office, James II awakened a sense of distrust and opposition; his attempts to raise a regular army, by demands for the necessary appropriations from Parliament, were the occasions of debate upon what the military establishment of the country was and should be. These arguments were renewed pro and contra on different occasions, but the king's wishes were disregarded when, at the very height of his power, the dangers of a standing army were emphasized by Parliament; and a bill to make a militia more efficient was passed at the same time that supplies for the army were granted. The popular feeling was embodied in what was said in Parliament at this time in answer to what the courtiers had to urge in favor of regular troops. Sir Edward Seymour, Sir William Twisden, Sir Richard Temple and Sir John Maynard, the most learned lawyer of this time, gave vent to these utterances. Said the first of these: «The militia might not be in a satisfactory state, but it might be remodeled, and he would rather give up a million to keep up a force from which he had nothing to fear than half a million to keep up a force of which he must ever be afraid.» The troops enrolled in the regular service, however, continued to increase in number, made necessary through the foreign relations of the English government, but the people accepted the increase always holding fast to the idea of a militia as their real protector. The force of circumstances, when the House of Orange was called to the throne, changed to an extent the feeling of the country in this regard, and danger from foreign foes made soldiers a necessity which the people reluctantly recognized, without such fear for their domestic content as they had before entertained. The sentiment of the country was again shown when the House of Hanover came to the throne of England, although at this time the regular army had become a permanency, having been continuously provided for on the theory that a standing army was a necessity «for better preserving the balance of power in Europe.» In 1757 the militia of England was again reorganized, the impelling motive being that which had always been uppermost in the minds of Englishmen, namely, to take away the pretext for a standing army, and a quota was fixed for each county. The provisions were for five years' service, the position of an officer was made important by proper qualifications and it was provided that without the exigency of service the companies should not be marched out of their counties. It was believed that the possession of the offices by gentlemen of estates would, although under the authority of the Crown, always ensure the services of the militia to the good of the people. This force gradually became, by reason of the limited size, the right given to furnish substitutes and a progressive necessity to supply pay, clothing and all other expenses, a feeder for the regular establishment, a distinct species of reserve, and in consequence the free, patriotic and military spirit of the country began to manifest itself by the creation of volunteer organizations. Prior to that time the «militia had enjoyed for many years as compared with the regular forces, a social, as well as a constitutional superiority.» The volunteers so called into existence now replaced, to an extent, that ancient power and continued until the events of the Boer War when they ceased to exist and the Territorial Army was created. The control of the militia of Great Britain was taken from the country and lodged in the Crown in 1871, and since then the militia has been a part of the regular force and has constituted the army that shared in the defeat of Germany.

The foregoing brief reference to the militia of Great Britain is of greater interest than an account of the militia of Greece, of Switzerland, of South Africa, of Argentina or of any other country, because it is the foundation of our military policy. In all free or republican countries the embodiment of the military spirit is shown by the willingness and ability to bear arms and to organize for war. The transition of nations from a condition of popular military education, discipline and strength, to military powers, possessing large armies, devoted to war for defense or conquest, involves an understanding of the great World War begun in 1914.

American Militia.— The peculiar life of the colonies in America rendered it necessary that the colonists should keep themselves armed and experienced in the use of weapons of defense; inheriting the institutions of the mother country, the existence of a militia was an assumed matter in their organization. The adoption of the Constitution of the United States, above quoted, in 1789 was the subject of innumerable debates and political views and prophecies, and the proceedings of the constitutional conventions concerning the adoption of the clauses relating to the militia are most interesting as a matter of political history; space, however, will not permit an account of them. Singularly enough, South Carolina and Virginia were on the side of giving the government greater power, while Massachusetts and Connecticut were opposed to curtailing the State control. Propositions were successively voted down in attempts to frame the Constitution in this regard, among others as follows:

(a) To make laws regulating and disciplining the militia, not exceeding one-tenth part in any one year.

(b) To establish a uniform and general system of discipline for the militia of the States and to make laws for arming and disciplining and governing such part of them as may be employed in the service of the United States.

(c) To establish a uniformity of arms, exercise and organization for the militia and to provide for the government of them when called into the service of the United States.

(d) To add to the clause reserving to the States respectively the appointment of the officers, the words «under the rank of General Officers.»

We have to bear in mind that the majority tried in many instances to yield to the general government the minimum of the powers deemed essential to that government, and this fact explains the fragmentary character of the provisions as to the militia. But the conviction was general that the militia must be trained with uniformity and be so organized as to become a defense to the nation, and that the only authority to provide therefor was the general government. Hamilton in the *Federalist* fully defended the Constitutional plan. Patrick Henry in Virginia was convinced that ruin would follow the adoption of the law. So much concern was felt regarding the militia that among the 10 amendments which were promptly made and declared to be in force 15 Dec. 1791 was that (No. 2), providing «a well regulated militia being necessary to the security of a free State, the right of the people to keep and bear arms shall not be infringed.» The State constitutions and the State laws have from time to time, and invariably, dealt with the militia of the respective States and are held by the courts to be controlling, so far as not inconsistent with the Federal laws, but they have not been uniform as to service, duty or organization. It has been demonstrated that Congress by the Act of 1792 made an ineffective law, by merely prescribing uniform duties for the entire male population composing the militia, and though thereafter for over 100 years the law was retained with slight amendment upon the statute book, it was not enforced and was the subject of repeated efforts at modification. The Presidents of the United States, notably Washington, Jefferson, Madison, Adams, Jackson and Van Buren in their messages to Congress, urged further legislation to create an efficient militia. Elaborate reports were made from committees in Congress, but nothing was accomplished except that in 1808 an annual appropriation of $200,000 was begun, which was increased in 1887 to $400,000 and in 1900 to $1,000,000. Between 1819 and 1825 various bills and propositions were advanced for a classification of the militia, so that only a small part of it would have duty to perform in time of peace; then a board was convened by the Secretary of War, which made a report that was transmitted to Congress recommending the instruction of officers in camps of instruction 10 days each year. Jackson urged encouraging volunteer organizations. The Secretary of War of President Van Buren's Cabinet, in 1840, proposed that 100,000 men apportioned to the States be maintained, by draft or otherwise, to serve four years, one-fourth to go out each year and to form the reserve, continuing as such four years more, the President to order the active portion on duty 30 days each year and defray all charges for pay, subsistence, etc. It is said that no subject, except finance, was more discussed prior to the Civil War than the militia. The debates in Congress are full of it, reports and bills are numerous, both from the War Office and the committees of the Senate and House, but as stated, they were unacceptable, until after the war with Spain. The language of the Constitution «reserving to the States respectively, the appointment of the officers, and the authority of training the militia according to the discipline prescribed by Congress,» was always considered to be an insurmountable obstacle to Federal control of the militia in time of peace. As indicated, the army and Congress long endeavored to secure the adoption of a plan to limit the organized militia to a practicable number.

Military Law of 1903.— In 1903 the United States Congress adopted a new militia law, by which the militia was defined to be practically all able-bodied males between 18 and 45 years, divided into two classes, namely (a) «the Organized Militia,» being such forces as may be created, under State laws, regardless of the name they bear, and (b) the remainder of the militia. A period of five years was given to all the States to adopt laws making the organization, drill and discipline of their organized militia the same as that of the regular army and the participation of the States in an annual appropriation of $1,000,000 was made dependent on such State action and the creation of forces accordingly; the limit in number was as it stood theretofore, to wit, 100 men for each Congressional representative; those States which became entitled to participate in the annual fund became a part of the «Organized Militia.» Authority was given to the President to call forth such number of the militia «organized» or «reserve,» as he might deem necessary, in case of invasion, danger of invasion, rebellion or inability to execute the laws of the Union, and officers or enlisted men who neglected to present themselves to a mustering officer to be mustered into the service of the United States, if found fit, were subject to trial by court-martial.

Subsequent to 1903, the continued threat of Mexican trouble kept the military topic uppermost and a continuous series of legislative measures followed.

In 1916 the country had advanced to the position that the above supposed insurmountable obstacle about appointing officers and training the militia should be surmounted — or ignored. By the Act of 3 June 1916, Congress enacted that the army of the United States consisted of the Regular Army, the Volunteer Army, the Officers' Reserve Corps, the enlisted Reserve Corps, the National Guard while in the service of the United States and such other land forces as are now or may hereafter be authorized by law.

The National Guard is thereby made the regular enlisted militia between 18 and 45 years of age organized, armed and equipped *as therein provided.* The number to be organized is in the proportion of 200 for each senator and representative in Congress, and increased each year in the proportion of 50 per cent until a strength of 800 for each senator and representative in Congress be reached, which creates theoretically a force of 420,000 men.

Power was given to the President to assign units to divisions, brigades, etc., and to detail officers to command them; likewise officers as chiefs of staff and assistants to the chiefs of staff. Adjutants-general of States report to the Secretary of War. Funds apportioned under «just and equitable procedure» in ratio of the number of enlisted men are to be paid for all general purposes. The States may fix the location of units within their borders and enlistments are to be for six years; three in the active and three in the reserve, and the law prescribes the contract, which creates a Federal soldier. Provisions for reserve units exist and authority is given to supply all material, as may be necessary to arm, uniform and equip the «National Guard,» also for training, inspections, service schools, details, courts-martial and pay for service. The «National Guard» may be used for Federal service or may be drafted into the military service of the United States, in which case they cease to be National Guard and are discharged therefrom.

On 6 April 1917, the United States declared a state of war, and then followed the enactment for universal military service. This great and wise step has done more to educate the United States than any act passed by Congress; and its relation to the militia of the United States will be far reaching.

The war having been brought to a close the continued pressure for universal military instruction and training has not yet resulted in concrete plans. The creation of reserve officers' training corps in colleges and universities under the National Defense Act of 1915 is being accomplished by the War Department and the officers' reserve corps is a present factor of great importance through the demobilization of the American Expeditionary Forces.

The fact that the great body of the militia (except the 420,000 above mentioned comprising the «National Guard») are not yet subject under the law to military consideration is not likely to be ignored permanently.

State Militia or State Guard.— For over 100 years the militia had been called the State force, being in time of peace under the State, as in England it was under the county; the new law seeks to secure uniformity and perfection through active national participation in control, under the general power in Congress to raise armies. The term «National Guard» had been adopted by some States to designate its organized or volunteer militia. This appellation was adopted by one of the most famous militia organizations of the world, the Seventh Regiment of New York, at the time Lafayette visited America in 1824 and in his honor, after the «Garde Nationale.» The State of New York appropriated the term in 1862 to describe the organized militia, and other States followed, but the term that Massachusetts has used, «Volunteer Militia,» was more correct. The organized militia of the States bore names as follows: Georgia, South Carolina and Florida «State troops»; Arkansas and Kentucky, «State Guard»; Louisiana, «State National Guard»; Rhode Island, «Militia»; Texas, «Volunteer Guard»; Virginia, «Volunteers»; Massachusetts, «Volunteer Militia.» The remaining States used the term «National Guard.»

The State guard, regardless of its name, has always been a volunteer body, and although in many States some military organizations have existed excellent in drill, discipline, rifle shooting and general military proficiency, actually comparable with corresponding bodies in the regular service, their character has been partly social. Sustained by men who were fond of military work and who enjoyed performing patriotic service and attaining a prominence which gratified pride, such units were developments of a latent military spirit and were the means of giving popular military education to the youth of the country.

The assumption of general and universal military training of the youth of the land by the Federal government, and the inhibition of the maintenance of troops by the State, except a police force or constabulary, brings the State guard into a new form of organization.

During the World War the States generally created defense bodies, or State guards without support of the Federal government, and in the reorganization of the National Guard they are likely to be absorbed.

The military policy of the nation involves the proper conception of the militia. It is a political, economic and patriotic question of statecraft. The military sciences, which have been so marvelously developed by war, will naturally enter into the question, as well as the trained personnel of the army and navy, because the subject relates to the embodiment of national forces, but only for the perfection of a result and not for its creation.

The military power is subordinate to civil authority except when the military power must be exercised for the life or welfare of the nation. Asserting that this should be always kept in mind, Hallam says: «Nothing would more break down this notion of the law's supremacy than the perpetual interference of those who are really governed by another law.»

Bibliography.— Concerning the English institution consult Edward, Earl of Clarendon, 'History of the Rebellion and Civil Wars in England'; Napier, 'Defence of England by Volunteers Corps and Militia'; Chamberlayne, 'State of England'; Grose, 'Military Antiquities respecting a History of the English Army'; Hallam, 'Constitutional History of England'; Macaulay, 'History of England'; Townshend and Windham, 'Plan of Discipline for Norfolk Militia' (1760); and for the United States reference may be made to Elliot's 'Debates,' Curtis' 'Constitutional History of the United States,' American State Papers (Military Affairs), Congressional Debates, reports of Secretaries of War and of congressional committees, messages of Presidents to Congress, opinions of attorney-generals, and numerous court decisions, both in the Federal and State courts. Among the former, reference should be made to the opinions of Justices Washington, Johnson and Story (in Houston v. Moore, 5 Wheaton, 1), of Justice Story (in Martin v. Mott, 12 Wheaton, 19), of Chief Justice Taney (in Luther v. Borden, 7 How. 1).

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MILITIA, Naval. See NAVAL MILITIA.

MILIUM, or GRUTUM, an old name, a skin disease caused by the retention of the secretion of the sebaceous glands, resulting in small white or yellowish-white globules the size of a pinhead or less, constituting a minute tumor. It usually forms around the eyes, on the cheeks or forehead, although it also occurs on other parts of the body. The tiny tumor lies just beneath the skin, slightly raised above its surface, and is supposed to form through the destruction of duct through which the secretion of the sebaceous formerly passed. It may undergo calcification, but at no time in the process of its formation nor in its continued presence is there inflammation. In some cases it disappears in the course of the continuous change in the cuticle. The treatment consists of opening the globule with a fine-pointed knife, evacuating the contents and treating the sac with tincture of iodine or nitric acid. Electrolysis is likewise employed in the same manner as for the permanent removal of hair.

MILK may be defined as the normal secretion of the mammary glands. The milk of all mammals is similar in qualitative composition, consisting essentially of water, fat, proteins, milk-sugar and salts or ash. Colostrum, the fluid secreted for a short time immediately after giving birth to the young, is composed of similar substances, but differs considerably from normal milk in its quantitative composition and physiological properties. The average percentage composition of some of the more important milks is approximately as follows:

	Water	Fat	Protein	Sugar	Ash
Human milk	88.00	3.80	1.50	6.40	0.30
Cows' milk	87.00	4.00	3.35	4.90	0.75
Goats' milk	85.70	4.75	4.30	4.45	0.80
Ewes' milk	80.80	6.85	6.55	4.90	0.90
Asses' milk	89.50	1.75	2.00	6.25	0.50
Mares' milk	90.75	1.20	2.00	5.70	0.35

Human milk varies to such an extent that any attempt to state its average composition is liable to be misleading. The percentage of any constituent, and especially that of proteins, may differ widely from that given above while the milk is still entirely normal. Such differences are found not only in the milk of different women, but in that of the same woman at different periods of lactation.

Cows' milk differs from human milk in containing less sugar and considerably more proteins and ash. The proteins are also of a somewhat different character, the casein being more easily coagulated and forming a denser curd. Goats' and ewes' milks being rich in fats and proteins are well adapted to the manufacture of cheese and are largely used for this purpose in some parts of Europe. Asses' and mares' milks have been recommended as preferable to cows' milk for infant feeding, since they show some resemblance to human milk in the amount and nature of the proteins which they contain. In this country, however, the milk of the cow is the only one of commercial importance. Unless otherwise explained all of the statements which follow will be understood to refer to cows' milk, but many of them are true of the milk of other mammals as well.

Cows' Milk.— The constitution of cow's milk has been concisely stated by Richmond: «It is essentially an aqueous solution of milk-sugar, albumin and certain salts, holding in suspension globules of fat and in a state of semi-solution, casein together with mineral matter. Small quantities of other substances are also found.» As regards its physical properties, milk is an opaque, white or yellowish fluid, somewhat heavier and more viscous than water, having a faint characteristic odor and a slightly sweetish taste. The yellowish color is due to the fat and the opacity and viscosity in part to the fat and in part to the casein and lime salts present. The specific gravity is usually between 1.029 and 1.034 at 15.5° C. (60° F.). Normal fresh milk shows toward litmus an amphoteric reaction, and reacts acid with phenol-phthaline. This property is attributed to the presence of phosphates and of carbonic acid. The gases contained in cows' milk, carbonic acid with small amounts of oxygen and nitrogen, are for the most part evaporated in the usual processes of handling the milk and therefore need not be further considered here.

Proportions of Water and Solids.— The proportion of water in cows' milk varies considerably, depending upon breed, individuality, period of lactation, etc. While the average amount is about 87 per cent, the mixed milk of a herd may easily show as much as 88 or as little as 85 per cent of water corresponding respectively to 12 or 15 per cent of solids. The milk of a single healthy cow in normal condition may sometimes contain as little as 10 or as much as 18 per cent of solids, while in extreme cases even these latter limits may be passed. The writer has found 19.88 per cent of solids in the milk of a perfectly healthy cow and 27.40 per cent in that of a cow having fever. Over 16 per cent of solids in the mixed milk of a herd or over 18 per cent in that of an individual is, however, comparatively rare.

Breed.— While much depends upon the individual cow, it is well known that some breeds tend to yield richer milk than others. The following figures, obtained by averaging the records of tests made at the New York and New Jersey agricultural experiment stations, serve to illustrate the variation in richness of milk yielded by different breeds:

BREED	Total solids, per cent	Fat, per cent	Solids-not-fat, per cent
Jersey	14.87	5.19	9.68
Guernsey	14.69	5.16	9.53
Shorthorn	13.38	4.05	9.33
Ayrshire	12.73	3.64	9.09
Holstein	11.96	3.43	8.53

Advance of Lactation.— After the third or fourth month the milk tends to increase in richness as lactation advances. A study of nearly 50 lactation periods of individual cows at the New York State Experiment Station yielded the following average results, the observation being continued in each case for 10 months:

MONTHS	Total solids, per cent	Fat, per cent	Solids-not-fat, per cent
First month	14.00	4.54	9.46
Second month	13.50	4.33	9.17
Third month	13.47	4.28	9.19
Fourth month	13.64	4.39	9.25
Fifth month	13.75	4.38	9.37
Sixth month	14.00	4.53	9.47
Seventh month	14.18	4.56	9.62
Eighth month	14.33	4.66	9.67
Ninth month	14.46	4.79	9.67
Tenth month	14.83	5.00	9.83

In the last few days of lactation, when the yield becomes very small, the proportion of solids often rises to a marked degree, sometimes reaching 20 per cent or over.

Food, Weather, etc.— Other conditions being the same milk is richer in winter than in summer, in cooler than in warmer weather, and on rich dry food than on pasture, except that on first turning the cows to pasture a richer milk may be obtained for a time. Probably anything which induces a greater consumption of food has a tendency to increase at first the richness of the milk secreted. In most cases, however, such increase in richness is found to be only temporary, the more permanent influence of better feeding being to improve the quantity rather than the quality of milk produced.

Partial Milking.— All of the statements regarding the composition of milk refer to the product of a complete milking. In partial or fractional milking the first portions drawn are comparatively poor, especially in fat, and the last portions or «strippings» are much richer.

Milk Fats.— Milk fat, like other fats, is a mixture of gycerides (compounds of glycerin and fatty acids). It differs from other animal fats in containing a smaller proportion of stearic acid and large proportions of the acids of lower molecular weight. A detailed study of the constitution of milk fat by Browne gave the following results:

ACID	Per cent of acid obtained	Corresponding per cent of glyceride
Oleic	32.50	33.95
Dioxystearic	1.00	1.04
Stearic	1.83	1.91
Palmitic	38.61	40.51
Myristic	9.89	10.44
Lauric	2.57	2.73
Capric	0.32	0.34
Caprylic	0.49	0.53
Caproic	2.09	2.32
Butyric	5.45	6.23
Total	94.75	100.00

The last four acids are the «volatile fatty acids,» the large amount of which serves to distinguish milk fat (butter) from other fats which as a rule have only a fraction of a per cent of these acids. In the milk the fat exists in the form of minute suspended globules which vary considerably in size, but average about $\frac{1}{10000}$ of an inch in diameter. A drop of average milk contains over 100,000,000 fat globules.

Amount of Fat in Milk.— The percentage of fat in milk varies more than that of any other solid constituent or, indeed, of all the other solids combined. In the mixed milk of herds where the influence of individual cases of advanced lactation is minimized, we may consider the usual range to be from 3 to 6 per cent of fat and from 8.5 to 9.5 per cent of solids not fat. Hence the varying richness of cow's milk is due principally to differences in fat content, and as fat is also the constituent of greatest pecuniary value, a «rich» milk is essentially one containing a high percentage of fat.

Nitrogenous Compounds or Proteins of Milk.— The greater part of the nitrogen in milk (usually over three-fourths) is in the form of casein, a compound protein which contains phosphorus in organic combination and is probably also combined with lime salts. Casein is readily coagulated by acids or rennet and the curd thus formed encloses the greater part of the fat which the milk contained. Of the nitrogen compounds other than casein, albumin is by far the most abundant. Milk albumin is not coagulated by rennet, nor by acids at ordinary temperatures, but is coagulated by heat. In addition to casein and albumin milk contains small amounts of other protein bodies including the enzymes or unorganized ferments which play an important part in cheese-making and probably aid the digestion when milk is consumed in the fresh state without previous heating. Among the nitrogenous compounds other than proteins which have been found in milk may be mentioned small amounts of lecithin, amino acids, «vitamines» and traces of ammonia and urea.

Amount of Proteins in Milk.— Formerly, through faulty methods of separation, the reported percentages of proteins were often very inaccurate and were usually too high. The amount of protein matter as determined by modern methods is usually between 3 and 4 per cent, being higher in those samples which are rich in fat. Average milk with 13 per cent of solid matter usually contains about 4 per cent of fat and 3 1/3 per cent of proteins. In richer milk the increased amount of solids is usually made up of about three-fourths fat and one-fourth proteins. In other words, the percentages of fat and proteins tend to rise and fall together approximately in the proportions represented by the formula — Proteins = 2.00 + 1/3 Fat. Variations in fat, especially if due to temporary causes, are not always accompanied by so much variation in proteins as the formula would indicate. On the other hand, the percentage of proteins is apt to exceed that indicated by the formula, in very advanced lactation. As a rule when the amount of solids-not-fat exceeds 9 per cent, the excess is due chiefly to excess of proteins.

Milk-Sugar.— Milk-sugar, or lactose, has the same composition as cane-sugar, but differs from the latter in some of its chemical properties and is less sweet and less readily soluble in water. The amount of sugar is rather more constant than that of proteins, being usually between 4.5 and 5.25 per cent in normal milks. While the latter figure is rarely exceeded, occasional samples may show considerably less than 4.5 per cent. In any genuine milk containing an unusually low percentage of solids-not-fat, the deficiency is apt to be principally in the milk-sugar. Such milk is apt to be yielded in case of fever or unusual excitement or fatigue, and may sometimes be obtained from apparently healthy cows under normal conditions, especially during hot, dry weather.

Salts or Ash of Milk.— When milk is dried and burned there remains a white ash, the average composition of which is stated by Fleishmann and Schrodt to be:

	Per cent
Potassium oxide	25.42
Sodium oxide	10.94
Calcium oxide	21.45
Magnesium oxide	2.54
Ferric oxide	0.11
Sulphuric anhydride	4.11
Phosphoric anhydride	24.11
Chlorine	14.60
	103.28
Less oxygen equivalent to chlorine	3.28
	100.00

A part of the phosphoric anhydride of the ash is derived from the phosphorus of the casein. The sulphuric anhydride also comes from the oxidation of the milk proteins. If these acid constituents are deducted the bases in the ash are found to be in considerable excess. In the milk these bases are combined partly with the casein and partly with citric acid, a very small quantity of the latter being a normal constituent of cows' milk. The amount of ash does not, therefore, exactly represent the mineral matter originally present. The ash of normal milk is usually between 0.65 and 0.80 per cent, averaging about 0.73 per cent. The ash tends to vary with the proteins approximately in the proportion — Ash = 0.38 + 1/10 Protein.

Nutritive Value and Place in the Diet.— From the above statements regarding the composition of milk one may conclude that it contains proteins, fats, carbohydrate and salts in good quantitative relation to each other. The nature of the nutrients in milk also emphasizes its value as a food. Recent feeding experiments comparing different proteins have shown milk albumin to have the highest nutritive value of any protein known, both for maintenance of grown animals and for supporting the growth of the young. Casein also has a very high nutritive efficiency and it is probably safe to say that the proteins of milk are of superior value in nutrition to those of any other known article of food. The fat of milk being in the form of an emulsion is more easily digested than ordinary food fats, and while the various fats after being digested and absorbed are of about equal value as sources of energy, yet milk fat and the butter made from it have been found to have a special value as food because of the presence therein of the recently discovered fat soluble vitamine mentioned below. The sugar of milk is less likely than cane sugar, either to directly irritate the stomach or to undergo fermentation, and it is among the most readily available of foodstuffs, requiring only a single cleavage to bring it into form for absorption and utilization by the body. The proportions of the different elements in the ash of milk make it an exceptionally valuable source of these inorganic foodstuffs, particularly because of its high calcium content. In addition to the foodstuffs of known chemical nature it has recently been found that there are required for normal nutrition two other substances or groups of substances both of which are furnished by milk. The one has already been mentioned as occurring in the milk fat. It is referred to in recent literature as «fat soluble vitamine or «fat soluble A». The other essential foodstuff furnished by milk is soluble in water and therefore remains in the skim milk in butter-making or in the whey in cheese-making. It is referred to as the «water soluble vitamine» and as «water soluble B.» Milk is therefore the nearest approach to «the perfect food» that we have in any one commercially available article of diet.

On account of the richness of milk in all groups of foodstuffs, including those whose existence has only recently been recognized, the purchase of milk at ordinary prices is a much more economical investment than is commonly supposed. For families spending as much as 20 cents per person per day for food, milk at 10 cents a quart may be considered a more profitable investment than the average of the food purchased; and for those able to spend 30 to 40 cents per person per day for food the purchase of the highest grade of milk, even at a price of 15 to 20 cents a quart, is by no means extravagant. The commonest defect of the dietaries of city families is the inadequate use of milk. Investigations under the auspices of the New York Association for Improving the Condition of the Poor have shown that city dietaries are more often deficient in calcium than in any other chemical element and that the use of more milk is the most effective way of remedying this defect and at the same time making the diet better balanced in other respects and much better suited to the needs of growing children. In families where there are as many children as adults, at least as much money ought to be spent for milk as for meat.

Food Laws — Standards of Purity.— On account of the great importance of milk as food most of the States had laws regulating the sale of milk and established standards of composition for it even before the enactment of the general food laws. More attention has doubtless been given to the standard of purity for milk than for any other article of food. The official definition and standard of composition followed in the enforcement of the United States Food and Drugs Act and is most of the States is as follows:

Milk is the fresh, clean, lacteal secretion obtained by the complete milking of one or more healthy cows, properly fed and kept, excluding that obtained within 15 days before and 10 days after calving, and contains not less than 8.5 per cent of solids-not-fat and not less than 3.25 per cent of milk fat.

In recent years much attention has also been given to the establishment of sanitary standards and the grading of milk on the basis of sanitary qualities. The grades and standards recommended by the National Commission on Milk Standards are as follows:

GRADE A.

RAW MILK.— Milk of this class shall come from cows free from disease as determined by tuberculin tests and physical examinations by a qualified veterinarian, and shall be produced and handled by employees free from disease as determined by medical inspection of a qualified physician, under sanitary conditions, such that the bacteria count shall not exceed 10,000 per cubic centimeter at the time of delivery to the consumer. It is recommended that dairies from which this supply is obtained shall score at least 80 on the United States Bureau of Animal Industry score card.

PASTEURIZED MILK.— Milk of this class shall come from cows free from disease as determined by physical examinations by a qualified veterinarian, and shall be produced and handled under sanitary conditions, such that the bacteria count at no time exceeds 200,000 per cubic centimeter. All milk of this class shall be pasteurized under official supervision, and the bacteria count shall not exceed 10,000 per cubic centimeter at the time of delivery to the consumer. It is recommended that dairies from which this supply is obtained should score 65 on the United States Bureau of Animal Industry score card.

GRADE B.

Milk of this class shall come from cows free from disease as determined by physical examination, of which one each year shall be by a qualified veterinarian, and shall be produced and handled under sanitary conditions, such that the bacteria count at no time exceeds 1,000,000 per cubic centimeter. All milk of this class shall be pasteurized under official supervision, and the bacteria count shall not exceed 50,000 per cubic centimeter when delivered to the consumer.

It is recommended that dairies producing grade B milk should be scored and that the health departments or the controlling departments, whatever they may be, strive to bring these sources up as rapidly as possible.

GRADE C.

Milk of this class shall come from cows free from disease as determined by physical examinations, and shall include all milk that is produced under conditions, such that the bacteria count is in excess of 1,000,000 per cubic centimeter.

All milk of this class shall be pasteurized, or heated to a higher temperature, and shall contain less than 50,000 bacteria per cubic centimeter when delivered to the consumer.

Whenever any large city or community finds it necessary, on account of the length of haul or other peculiar condition, to allow the sale of grade C milk, its sale shall be surrounded by safeguards such as to insure the restriction of its use to cooking and manufacturing purposes.

These grades and standards have been adopted, either directly or with such modifications as local conditions might suggest, in several of the States and cities of the United States and it seems certain that such grading of the milk supply will soon become the general rule.

Significance of Bacteria in Milk.— There has been considerable controversy as to what sanitary significance can properly be attached to the presence of large numbers of bacteria in milk. It is certain that many of the species which multiply most rapidly in milk are entirely harmless and in fact certain fermented milks which contain enormous numbers of lactic acid bacteria are believed by many to be particularly wholesome. On the other hand it is, in general, only as a result of unsanitary methods or insufficient safeguards in the handling of milk that the large numbers, sometimes found in market milk, can be accounted for, so that in general the presence of large numbers of bacteria reflects serious doubt upon the sanitary quality and even upon the wholesomeness of milk. Present opinion on this matter is perhaps best presented in the words of the following resolution recently adopted by the Commission on Milk Standards:

" Whereas, milk is one of the most perishable foods, being extremely susceptible to contamination and decomposition, and

" Whereas, the milk consumer is justified in demanding that milk should be clean, fresh and cold, in addition to having the element of safety, and

" Whereas, milk which is from healthy cows and is clean, fresh, and which has been kept cold, will always have a low bacterial count, and

" Whereas, milk that is dirty, stale, or has been left warm, will have a high bacterial count; therefore, it is resolved:

" First: That the health officer is justified in using the bacterial count as an indicator of the degree of care exercised by the producer and dealer in securing milk from healthy cows and in keeping the same clean, fresh and cold; and

"Second: That the health officer is justified in condemning milk with a high bacterial count as being either unhealthy or decomposed, or containing dirt, filth, or decomposed material as a result of the multiplication of bacteria due to age and temperature.

"Third: That the health officer is justified in ruling that large numbers of bacteria are a source of possible danger, and that milk containing large numbers of bacteria is to be classed as unwholesome, unless it can be shown that the bacteria present are of a harmless type, as for example, the lactic acid bacteria in buttermilk, or other especially soured milks."

Pasteurization.— Since under ordinary conditions it is not always possible to guard perfectly against the possible introduction of the germs of communicable disease into milk and since times and temperatures of heating milk, so as to ensure destruction of such pathogenic bacteria with exceedingly little, if any, injury to the milk itself, have now been thoroughly worked out, there is now practically unanimous agreement among those most interested in the subject that all milk, except that produced under extraordinarily good sanitary conditions, should be subjected to modern low temperature pasteurization before being used. In order to guard against injury to the antiscorbutic properties of the milk it should preferably be pasteurized at a temperature of only 140° to 145° F. (60° to 63° C.). Heating at this temperature for 20 to 30 minutes is the best safeguard against distribution of disease through milk; and milk thus pasteurized and protected from subsequent contamination or deterioration may be used with confidence that it has been rendered safe as regards pathogenic bacteria without serious injury to any of the normal constituents of the milk itself. Since there is a possibility that the antiscorbutic properties of milk may be injured to a slight extent by even low temperature pasteurization, it is advisable that infants and young children fed on pasteurized milk should be given orange juice or other food of known antiscorbutic property and suited to the age of the child.

Preservation of Milk.— Milk produced under usual conditions contains large numbers of bacteria. At ordinary temperatures these multiply rapidly and soon cause such changes as to render the milk unsalable, if not unfit for use. Various preventive measures may be adopted, either to prevent bacteria from getting into the milk, to check or control their growth or to destroy them entirely. Strict cleanliness and the use of sterilized utensils exclude a large proportion of the bacteria usually present in milk and greatly improve its keeping qualities. If such milk is protected from access of air and kept cold, it will remain sweet and fresh for at least two or three weeks without any other preservative measures. (The sanitary production and handling of milk are more fully described in the article: DAIRY INTERESTS, AMERICAN). In this respect the American dairy practice is much in advance of that of other countries, as was strikingly shown at the exhibit of dairy products at the Paris Exposition of 1900. Three dairies engaged in city milk supply, one in New York, one in New Jersey and one in Illinois, sent regular shipments of fresh milk and cream to Paris throughout the summer. These products were found to be sweet and sound when opened from 15 to 20 days after bottling, and it was only with great difficulty that European dairy experts could be convinced that nothing but «cleanliness and cold» had been used to preserve them. No other country except France attempted to show natural milk and cream and the French exhibits were all sour on the second or third day.

It is evident that milk may be preserved much longer than is usually necessary by the observance of cleanliness to exclude bacteria as far as possible and the maintenance of a low temperature to retard the growth of those present.

Chemical Preservatives.— Various substances have the power of preventing or retarding the growth of bacteria. Those most often used to prevent milk from souring are boracic acid or borax, and formaldehyde. Much more rarely salicylates, chromates, fluorides and other substances have been reported. Since milk often forms the sole food of infants and invalids, the use of chemical preservatives is more objectionable in milk than in other foods and should be strictly prohibited, as is usually the case.

Milk is sometimes treated with carbonate or bicarbonate of soda which neutralizes the lactic acid which would otherwise make the milk sour. These substances do not check the growth of bacteria but simply mask the results of their activity. By neutralizing the lactic acid they favor the growth of the bacteria which attack the proteins as well as those which affect principally the milk-sugar. Such milk, therefore, tends to become unwholesome more rapidly than milk to which nothing is added.

Methods of Analysis and Detection of Adulterations.— The complete analysis of a sample of milk requires much time and elaborate apparatus and is not practicable for others than trained chemists. The tests described below are more easily performed and if carefully carried out will in many cases yield all the information required. Before taking a portion for any determination the milk to be tested should be thoroughly mixed by repeatedly pouring it from one vessel to another.

Determination of Fat.— Since fat is both the most valuable and the most variable of the solids in milk, its determination is often required. This may be accomplished by the method devised by Dr. S. M. Babcock, of the Wisconsin Agricultural Experiment Station, and popularly known as the Babcock test. In making this test, a measured amount of milk is treated with about an equal volume of commercial concentrated sulphuric acid which dissolves the other constituents, leaving the fat free in a heavy solution from which it is separated by centrifugal force and collected in the graduated neck of the test bottle, where its volume is read off at once on the completion of the test. Complete directions are furnished with the testing outfit, which can be purchased for a few dollars from dealers in chemical apparatus or dairy supplies.

Determination of Specific Gravity and Estimation of Solids-Not-Fat.— Since the specific gravity of milk is raised by all of the other solids and lowered by the fat, it follows that after the influence of each has been determined, it should be possible to estimate from the percentage of fat and the specific gravity the percentage of solids-not-fat which the sample contains. To determine the specific gravity it is convenient to use a «Quevenne» or a «Soxhlet» lactometer, either of which is practically a hydrometer of sufficient range to cover the gravity of all ordinary milks and so graduated that the thousandths in excess of unity are represented by whole numbers on the scale. Thus a milk with a specific gravity of 1.0315 will give a lactometer reading of 31.5. The temperature should be observed at the same time with the lactometer reading and the latter corrected to 60° F. by adding to the reading 0.1° for each degree F. above the standard temperature of 60° F. One-fourth of the corrected lactometer reading plus one-fifth of the percentage of fat gives a fairly close approximation to the percentage of solids-not-fat. The lactometer reading may also be useful aside from the estimation of solids-not-fat. Although the addition of cream to milk would lower the gravity, yet in general the lactometer reading is a rough indication of the richness of the milk, because a high percentage of fat is usually accompanied by a high percentage of protein which raises the lactometer reading. Cases in which genuine milk shows a low gravity as the result of a high percentage of fat are not common and can usually be detected by noticing the viscosity and opacity of the milk as it runs from the bulb of the lactometer. The lactometer reading taken in connection with the appearance is therefore a useful preliminary test and is used as such by the milk inspectors of many cities.

Detection of Skimmed or Watered Milk.— The most common adulterations of milk are the removal of cream (or the addition of skimmed milk, which amounts to the same thing), and the addition of water. Milk which contains less than 3 per cent of fat has usually been partially skimmed, and milk containing less than 8.5 per cent of solids-not-fat has usually been watered. In most States there are minimum limits established by law and milk falling below the limit is considered to be adulterated. Thus in New York State milk must contain at least 3 per cent of fat and at least 11.5 per cent of total solids. As stated above, the percentage of fat varies much more than that of solids-not-fat. Skimming is therefore more difficult to detect than watering. In fact, it is usually impossible to distinguish by analysis between a genuine sample containing, say, 3.6 per cent of fat, and a sample originally containing 4.5 per cent of fat, one-fifth of which has been removed. On the other hand, the addition of 20 per cent of water would almost certainly reduce the percentage of solids-not-fat to a figure considerably below the normal minimum. Recently, too, a more delicate method for the detection of watering has been devised.

Other Adulterants.— The addition of chalk, calves' brains, etc., though frequently mentioned in the older works on food adulteration, is now almost unknown. Cane-sugar or starch may sometimes be added to mask the effect of watering. The former may be detected by the rose-red color produced when about 10 cubic centimeters of milk are boiled for five minutes with one cubic centimeter of hydrochloric acid and 0.1 gram of resorcin. To detect the presence of starch, boil about 10 cubic centimeters of milk, cool it thoroughly and then add a few drops of a solution of iodine in potassium iodide. If starch is present a characteristic blue color will be produced.

Artificial Coloring Matter.— Caramel or yellow coloring matter such as is commonly used in butter may occasionally be added to milk. The detection of these is of little practical importance, since they would ordinarily be used only to mask the effects of gross skimming or watering such as would be readily detected by the methods already given.

Detection of Preservatives.— FORMALDEHYDE («FORMALIN»).— Dilute the milk with an equal bulk of water in a test tube and carefully pour in commercial concentrated sulphuric acid, inclining the tube so that the acid and milk will not mix. If formaldehyde is present a violet ring forms at the junction of the two liquids. If pure acid is substituted for the commercial, a trace of some ferric salt should be added. BORACIC ACID OR BORAX.— Evaporate a portion of the milk to dryness and burn to ash. Moisten with a few drops of dilute hydrochloric acid and introduce a slip of yellow turmeric paper. This is turned reddish brown by boracic acid and the color may be changed to bluish black by treating with a solution of sodium carbonate. CARBONATES or BICARBONATES if present in the milk would remain as carbonate after ignition and be shown by an effervescence when the ash was moistened with acid in the test for boracic acid just described.

Bibliography.— Aikman, C. M., ‘Milk: Its Nature and Composition; A Handbook on the Chemistry and Bacteriology of Milk, Butter and Cheese’ (New York 1895); Allen, A. H., ‘Commercial Organic Analysis’ (Vol. IV, New York 1898); Buchanan, R. E., ‘Household Bacteriology’ (New York 1913); Chapin, H. D., ‘Theory and Practice of Infant Feeding’ (New York 1902); Conn, H. W., ‘Agricultural Bacteriology’ (3d ed., Philadelphia 1918), ‘Bacteria in Milk and its Products’ (Philadelphia 1903); Farrington and Wall, ‘Testing Milk and Its Products’ (Madison, Wis., 1912); ‘Diseases of Infancy’ (New York 1902); Hunziker, O. F., ‘Condensed Milk and Milk Powder’ (Lafayette, Ind., 1914); Lane-Claypon, ‘Milk and its Hygienic Relations’; Lezé, R., ‘Les industries du lait’ (Paris 1904); Richmond, ‘Dairy Chemistry’ (1899); Rose, M. S., ‘Feeding the Family’ (New York 1917); Rosenau, M. J., ‘The Milk Question’ (New York 1912); ‘Preventive Medicine and Hygiene’ (New York 1913); Rothschild, ‘Bibliographia Lactaria’ (8,375 titles, Paris 1901); Russell and Hastings, ‘Outlines of Dairy Bacteriology’ (9th ed., Madison, Wis., 1910); Savage, W. G., ‘Milk and the Public Health’ (London 1912); Sherman, H. C., ‘Food Products’ (New York 1914); ‘Chemistry of Food and Nutrition’ (2d ed., New York 1918); Snyder, H., ‘Dairy Chemistry’ (New York 1906); Stocking, W. A., ‘Manual of Dairy Products’ (New York 1916); Van Slyke, L. L., ‘Modern Methods of Testing Milk and its Products’ (New York 1906); Wing, H. H., ‘Milk and its Products’ (rev. ed., with bibliography, New York 1913). Consult also *Reports* and *Bulletins* of the United States Department of Agriculture; the United States Public Health Service; the State departments of agriculture and of health and the agricultural experiment stations.

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MILK, Human. This liquid has a specific gravity of 1028.34, and contains water, 87.4; total solids, 12.6; fat, 3.4; albuminoids, 1.2; sugar, 7.0; ash, 0.2. It is slightly alkaline, is sterile and differs mainly from cow's milk in being sweeter and having less fat and casein. Its fat is more fluid and the casein is more readily dissolved. Cow's milk is frequently acid and its casein is often digested with difficulty. Experience shows that an infant should, if possible, be nursed during the earlier months of its life, for human milk is usually adapted to the digestive powers of infants. Its alkalinity, its temperature (98°–100° F.), its chemical constituents aid the development of the child. But poor health of the nurse, mental emotions, improper food or deranged digestion of the infant may prevent natural feeding or require its cessation. It is an interesting fact that the demands of the nursing infant have a great influence upon the *quantity* of mother's milk. Thus a wet nurse feeding two infants produced 720 grams, but this quantity increased to 1,750 grams when it becomes necessary for her to nurse five. In human milk there is a great variability in the fat contained, while the globules are more numerous in human than in cow's milk. The effect of variation of food upon the composition of human milk is doubtful, with the exception that when the mother is undernurtured, her consumption of fat will increase the fat in her milk. but when fat is fed to well-nurtured mothers the fat in their milk increases only temporarily. It is therefore concluded that only a diminution of food can permanently affect the fat in human milk. The effect of some drugs is seen in the mother's milk. Traces of alcohol have been found in the milk of mothers after they have drunk to excess. In cases where the mother is syphiletic, the injection of salvarsan has produced an excretion of it in her milk and in these cases the child which has also the disease is sometimes improved but has in other cases died. Immunity to certain diseases is thought to be secured through the mother's milk, from the fact that typhoid fever, mumps, scarlet fever and measles are not usually contracted by nursing infants.

If it is impossible for any reason for the mother to nurse her own child, and a suitable wet nurse cannot be obtained it is quite easy for the physician to direct the making of a modified milk from cow's milk which shall have almost the same properties as human milk, this is secured by the removal of the cream or a part of it and mixing it with the proper proportion of the skimmed milk and with milk-sugar. Often a small amount of lime water is added to offset the greater acidity of cow's milk. For this modified milk it is imperative that the cleanest possible raw milk be had, as pasteurization of the milk removes some of the requisite qualities and that the cream be «gravity cream,» i.e., be not removed by a separator which produces so-called «Centrifugal cream.» With modified milk prepared in this way under the direction of a physician experienced in infant's diet the child may be brought up to be quite as healthy as those fed at the breast. The formula of milk, cream, sugar of milk and lime water will be changed from week to week as the child increases in weight and the sugar of milk and lime water gradually diminished until the infant's digestion is trained to take unmodified cow's milk.

MILK-CURE. The living on milk alone, or mainly, for weeks is a recognized form of treatment in obstinate hysteria, hepatic congestion, dropsy and various disorders of nutrition. The amount of milk taken is gradually increased, beginning at about four ounces every three hours. When used exclusively, two or more quarts are ordinarily consumed daily. When the taste of milk becomes disagreeable, salt, coffee, bread, arrowroot, cocoa, rice, etc., may be added as the attending physician decides. The sole use of milk for a length of time may increase the frequency of the pulse, stimulate the kidneys to undue action, coat the tongue and produce obstinate constipation. It is not a cure to be undertaken without the supervision of a physician.

MILK-FEVER (called ephemeral fever when the symptoms disappear very quickly) is a febrile state, the temperature reaching 102° F. or over, occurring in the mother usually two or three days after delivery, considered to be connected with the beginning of the milk supply. It chiefly affects those in a feeble condition or under- or over-fed, or in whom the milk-ducts have not been freed by early lactation. A chill may induce it. It occurs in the lower animals as well as in the human being. It begins with rigors, which are followed by headache, pains in the limbs, fever, swelling and tenderness of the breasts (going on, it may be, to abscesses), and sweating, when the symptoms abate. Pain is to be relieved by hot-water bottles, breasts to be emptied, bowels moved by salines and fever reduced by diaphoretics; other medicines may be necessary. Owing to antiseptic obstetrics and great care as to hygienic measures, milk-fever is nowadays comparatively rare. If not relieved promptly by medical skill, it may prove a dangerous disease.

MILK FISH, a clupeod fish (*Chanos chanos*) common in the Pacific Ocean and valuable as a food fish. It attains a length of about four feet.

MILK-LEG. See PHLEGMASIA.

MILK-SICKNESS (sometimes called «trembles»), a malignant fever attacking man and some of the lower animals, such as unweaned calves and their mothers, horses and colts, sheep and goats. Formerly it prevailed in the Western and Southwestern States, recently in North Carolina and Indiana. The cause was formerly supposed to exist in poisonous herbs eaten by cattle, but later researches have established the fact that it is caused by the presence of the *Bacillus lactimorbi* discovered by Jordan and Harris in 1907–09. Man is infected by the products of cattle — meat, milk, cheese or butter. The disease belongs to the end of summer and the beginning of autumn. The symptoms are headache, loss of appetite fatigue, nausea, vomiting, thirst, constipation, a foul breath, then a typhoidal condition with coma or convulsions. The prognosis is generally favorable, but death may occur in a few days. The duration of the disease is from two or three days to as many weeks. The treatment consists in clearing out the intestinal tract, and in administration of sodium bicarbonate. Serum therapy has not yet been successfully tried.

Infected animals should be isolated and no milk or milk products used either for animals or humans.

MILK SNAKE. See HOUSE-SNAKE.

MILK-TREE, any of various tropical trees yielding a milky, wholesome sap. See COW-TREE.

MILK-VETCH, a pea-plant of the genus *Astragalus* (see VETCH), regarded as increasing the flow of milk when eaten by goats. Many species grow in the United States, especially on the Western plains, where they are useful fodder-plants, although including one baneful species, the locoweed (q.v.).

MILKWEED. See ASCLEPIAS.

MILKING MACHINE, a mechanical apparatus for milking cows without hand labor. The milking is accomplished by producing a vacuum at the end of the cow's teat. The apparatus consists of a rigid teat cup with a collapsible upper edge for the purpose of preventing the entrance of air, and which receives the milk, the four cups being attached to four rubber tubes which are connected to a larger rubber tube emptying into a covered pail. One or two cows are attached to a pail and the vacuum is furnished by a large pump, run by electricity or gasoline, and is made intermittent by means of a pulsator piston. Some machines are provided with an air filter which further lessens the danger of contamination to the milk. While the machines are still in process of improvement there are several which perform their work efficiently and without injury to the cow, while at the same time producing milk in which the bacteria count is reduced to a minimum provided the apparatus is kept thoroughly clean and the rubber tubes and teat cups immersed in a 10 per cent solution of salt when not in use. The bearing of the machine on the labor problem is considerable, since two men can raise food and otherwise provide requisite care for a herd of cows for which three milkers are required. The practicability of the machine depends largely upon the size of the herd, the attitude of the men toward the machine and their adaptability in using it. Young cows are said to take more readily to machine milking than those long milked by hand, and young cows hard to milk because of short teats and older cows known as «hard-milkers» are often more satisfactorily milked bv the machine than by hand. A quiet, well-treated herd is said to yield more readily to the use of the machine than a herd roughly handled. In some cases no difficulty is encountered in milking «clean» by the machine, and in others it is found more practical for one man to operate two double milking units while a second man follows and «strips.»

MILKOWSKI, Zygmunt, or **Sigismond** (pseud. THEODORE THOMAS JEZ), Polish novelist: b. Saracea, 1824; d. Lausanne, Switzerland, 13 Jan. 1915. He was educated at the Odessa Lyceum and at the University of Kiev, and was connected with the Hungarian uprising in 1848 and with that of Poland in 1863. He was thereafter compelled to live abroad and in 1877 he settled definitely in Switzerland, becoming curator of the Polish Museum at Rapperswil. His romances founded on Galician history form an important contribution to the literature of the Slavonic peoples, but his novels with Polish historical backgrounds were less successful. He wrote ‹Handzia Zahornica› (1860); ‹Szandor Kowacz› (1861); ‹Historya o praprawnuku i prapradziatku› (1864); ‹Uushoki› (1870); ‹Derslaw z Rytian› (1872); ‹Ofiary› (1874); ‹Pod Obuchem› (1878); ‹Z ciezkich dni› (1881); ‹Narceczona Harambaszy› (1882); ‹Rycerz chrzescianski› (1890), etc.

MILKWEED, or **MONARCH BUTTERFLY,** a large, reddish-brown, black-veined nymphalid butterfly (*Anosia plexippus*) of North America. Its black and green caterpillars, which have a pair of black filaments at each end of the body, are found upon milkweed almost throughout the world. The bright green, gold-dotted chrysalids hang from the under sides of the leaves in midsummer. The adults, which are among the strongest flyers of their order, migrate southward in the autumn and hibernate. In spring they fly northward even into Canada. They often form immense flocks in glades, even concealing the bark of trees upon which they alight in the lee of the wind. They are protected from their enemies by scent scales and are imitated by species not so protected, especially in the United States by the viceroy butterfly (*Easilarchia disippus*).

MILKWORT, the common name for plants of the genus *Polygala,* widely distributed throughout the temperate and tropical zones. See POLYGALA.

MILKY WAY, The, or **THE GALAXY,** in astronomy a luminous band of irregular form, consisting of a great circle entirely surrounding the heavens. It contains myriads of stars, so crowded together that their united light only reaches the unaided eye; this band of stars can be seen on any dark, clear night. If we could stand where the earth is and have it removed, we could see this splendid circle completely surrounding us; it is thus reasoned that we are a part of the Milky Way, and that our sun is near the centre of it. The circumpolar constellations Cassiopeia and the Swan are always to be found in the Milky Way, while Sirius, Capella and Aquila may be seen on its edge when they are in sight. The formation of the Milky Way assumes the general appearance of a silvery ribbon, but in places it is divided into two great branches, which afterward reunite. Between these divisions are dark places comparatively devoid of stars; one of these, the Coal Sack, has become celebrated, and was so named by sailors because they could see no stars in this dark spot.

MILL, Hugh Robert, Scottish geographer: b. Thurso, Caithness, 28 May 1861. He was educated at the University of Edinburgh, was physicist and chemist to the Scottish Marine Station in 1884–87 and University Extension lecturer in 1887–1900. He was librarian for the Royal Geographical Society in 1892–1900; and in 1910 presented to the trustees the accumulated records for the rainfall of the British Isles from 1677. Since 1901 he has edited *British Rainfall* and *Symons's Meteorological Magazine.* He wrote ‹The Realm of Nature› (1892; new ed., 1913); ‹The Clyde Sea Area› (1895); ‹The English Lakes› (1895); ‹Hints on the Choice of Geographical Books› (1897); ‹New Lands› (1900); ‹The Siege of the South

Pole› (1905); ‹Historical Introduction› to Sir Ernest Shackleton's ‹Heart of the Antarctic› (1909). He also edited the ‹Report of the Sixth International Geographical Congress› (1896), and ‹The International Geography› (new ed., 1911).

MILL, James, British economist, historian and utilitarian philosopher: b. Northwater Bridge, Forfarshire, Scotland, 6 April 1773; d. Kensingston, 23 June 1836. His father was a cobbler, his mother a farmer's daughter and his early abilities were so marked that great care was taken with his education, so that in 1790 he entered Edinburgh University. There he was carried away with Dugald Stewart's philosophy until he came to know Bentham's system, which he then adopted. But in the university he was better known as a remarkable Greek scholar than as a philosopher. In 1802 he went to London, where he was from 1803 to 1806 editor of the *Literary Journal* and then began the ‹History of India,› which occupied him 10 years. During this time he wrote much for periodicals and came to know Bentham personally; at the same time he was busied with the painstaking education of his children, notably John Stuart Mill (q.v.). The ‹History of India,› a wonderfully scholarly and unpartisan work, marred only by his lack of personal knowledge of country and people and a consequent theorizing at times, was published in 1818 and immediately won for him a place in the India Office and relief from his long battle with penury. This position was the more flattering a tribute since he was now well known as a radical and a skeptic. He rose rapidly, becoming head of the office in 1830. The *Westminster Review* founded in 1824 as the organ of Bentham's followers contained many contributions by Mill; and several appeared in the *London Review.* Both in ethics, where his position was strongly utilitarian, and in political economy, where he may still be reckoned as typical of the orthodox school so bitterly attacked by Ruskin, Mill is little more than a follower of Bentham, with greater force, perhaps, because of his comparatively larger knowledge of the world. In psychology, however, although largely a follower of Hartley, his work is more important, for he developed and gave to Hartley's principle of association a wider application, and thus was the founder of the school to which Spencer and Bain belong. Mill took part in politics and contributed largely to the success of the Reform Bill by introducing to England philosophical radicalism. His personal character was strangely unhuman and unlovable, though perfectly correct. His important works besides the ‹History of India› are ‹Elements of Political Economy,› the first great philosophic treatise on the subject (1821), and ‹Analysis of the Phenomena of the Human Mind› (1829). Consult Bain's biography (1882) and J. S. Mill's ‹Autobiography› (1867).

MILL, John Stuart, English social and political reformer, philosopher, economist: b. London, 20 May 1806; d. Avignon, 8 May 1873. Few have combined so intimately a vital enthusiasm for human progress, with a keenly critical and most scholarly temper. He presents in all his most important lines of work the interesting conflict which results when a candid, open mind, instinct with human interest, attempts to work with narrow conceptions and an inadequate method. The conceptions and method have in many respects been superseded, but the candor and sincerity, the scholarly, investigative temper, the deep interest in all things human, the democratic sympathy which manifest themselves in his works, give them permanent value.

Mill was the oldest son of James and Harriet (Burrow) Mill. His early education, conducted by his father, was extraordinary. He began Greek when about three years old, and Latin at seven, and read a great amount in both languages, especially in Greek, before he was 12. He studied algebra, geometry and the differential calculus also in this period. History he read of his own accord and found amusement in books on natural science. At 12 Aristotle's ‹Logic› began a more advanced course of instruction which included the more difficult classical authors, and ended, so far as his father's personal instruction was concerned, in his 14th year with a thorough study of Ricardo's ‹Political Economy.› Mill himself says that it «was not an education of cram.» «Anything which could be found out by thinking I never was told, until I had exhausted my efforts to find it out for myself.» At the same time he declares that it «was in itself much more fitted for training me to *know* than to *do.*» After a year in France, which had an important influence, the reading of Bentham made an epoch in his life. «I now had opinions; a creed, a doctrine, a philosophy; in one among the best senses of the word, a religion; the inculcation and diffusion of which could be made the principal outward purpose of a life.» In the winter of 1822–23 he planned a society to which he gave the name of «Utilitarian,» and thus brought the term into common use. In May 1823 he received an appointment from the East India Company as clerk in the office of the examiner of India correspondence. Here he remained 35 years, rising to be examiner two years before the transfer of India to the British government in 1858, when he retired upon a pension of £1,500. He became a frequent contributor to the *Westminster Review* founded in 1823 as a Radical organ, and in 1834 became editor of a new Radical review, the *London Review* (afterward the *London and Westminster*). He was one of an ardent party of «philosophic radicals»; his object in life «to be a reformer of the world.» Bentham, Malthus and Ricardo were influential upon the group. But several new influences now began to unsettle his political and social views. Coleridge, especially through Maurice and Mill's intimate friend Sterling, Carlyle, Goethe, Wordsworth, and the Saint Simonians, gave broader views of human interests, and greater importance to feeling and sentiment than James Mill and Bentham. In Mill's own judgment, however, the most important influence, especially in leading «him to apply his abstract principles to the actual state of society and estimate their bearing upon human interests and sympathies more clearly and widely than he would otherwise have done,» was that of Mrs. Taylor, to whom he was first introduced in 1830. He maintained with her for 20 years a friendship of increasing intimacy, and after the death of her husband married her in 1851. Mill loved his wife tenderly and spoke of her, notably in the ‹Autobiography,› and in the dedication of the volume ‹On Liberty› which was a joint production, in terms which seemed extravagant to his friends. A third period of Mill's mental progress fell at about the time between the first and third editions of his ‹Political Economy› (1848–52). In the earlier period, he writes in his ‹Autobiography,› «I was a Democrat, but not the least of a Socialist. We were now much less democrats than I had been, because so long as education continues to be so wretchedly imperfect, we dreaded the ignorance and especially the selfishness and brutality of the mass; but our ideal of ultimate improvement went far beyond Democracy, and would class us decidedly under the general designation of Socialists.» In 1858 his wife died of congestion of the lungs in Avignon. When the Civil War in America broke out he contributed a strong article on the side of the North. In 1865 he was elected a member of Parliament from Westminster, and took an active part in support of various reform measures, but was defeated for re-election in 1868. His later years were spent in literary labors until his death, which occurred at Avignon. He had then come to be generally regarded as the foremost living philosopher and economist of England.

Mill's published works are the following: ‹System of Logic› (1843); ‹Essays on some unsettled questions of Political Economy› (1844); ‹Principles of Political Economy› (1848); ‹Memorandum of the Improvements in the Administration of India› (1858); ‹On Liberty› (1859); ‹Thoughts on Parliamentary Reform› (1859); ‹Dissertations and Discussions› (1859–75); ‹Considerations on Representative Government› (1861); ‹Utilitarianism› (1863); ‹Examination of Sir William Hamilton's Philosophy› (1865); ‹Auguste Comte and Positivism› (1865); ‹England and Ireland› (1868); ‹Subjection of Women› (1869); ‹Autobiography› (1873); ‹Nature, the Utility of Religion and Theism› (1874). In addition may be mentioned his edition, with notes, of James Mill's ‹Analysis of the Phenomena of the Human Mind› (1869); his ‹Inaugural Address delivered to the University of Saint Andrew's› (1 Feb. 1867); ‹Speech in Favor of Women's Suffrage,› 12 Jan. 1871 (1873); ‹Speech on the Admission of Women to the Electoral Franchise,› 20 May 1867 (1867); H. D. Pym's ‹Memories of Old Friends,› which contains 14 letters from J. S. Mill (1882); several articles in the *Westminster Review* and the *London and Westminster Review,* not reprinted in the ‹Dissertations and Discussions.›

The keynote to Mill's method is found in the individualism which he inherited from the 18th century. This meant associationalism in logic and psychology, a metaphysical conception of reality as made up of separate phenomena, an ethical theory that made pleasure and pain the motives of action, *laissez-faire* in political economy, and the political doctrine that the end of government is to protect each individual in the possession of the produce of his labor. But in all these various fields he passed the bounds set by his inheritance. He was more concerned to find truth than to maintain a creed.

As *Logican,* Mill's greatest contribution was his treatment of induction. The four «methods» of agreement, difference, residues and concomitant variation had been mentioned by J. Herschel, but were by Mill first brought out clearly. In the part of his ‹Logic› which deals with the nature and conditions of knowledge he attempts, with only partial success, to give logic a more vital relation to truth and fact than it had borne since Hobbes and Locke. He insists that propositions concern «things» not «ideas»; that there are «real kinds,» not merely class names; that cause is not to be defined with Hume as «invariable antecedent» but as «unconditional antecedent» or «sum of conditions.» But he does not see that this really implies a reconstructed view of nature, in which a conception of an interrelated system or whole should replace the conception of a mere sum of individuals or particulars. He remains true to his older presuppositions in holding that reasoning is from particular to particular, and that axioms owe their force to association. Matter, he holds, following Berkeley, is only permanent possibilities of sensation. In his view of the self, on the one hand, he considers that we can know only states of consciousness, that the law of association is the «governing principle,» and that the conceptions by which knowledge is organized are impressed upon the mind from without»; on the other hand he recognizes «the paradox, that something which, *ex hypothesi,* is but a series of feelings, can be aware of itself as a series.» He therefore admits that «the mind, or ego, is something different from any series of feelings or possibilities of them.» While, then, he holds to the doctrine of «circumstances» as determining character, he is careful to insist that this is not «necessity» in the ordinary sense; «our own desires can do much to shape those circumstances.»

As *Economist,* Mill attempted to follow the general plan of Adam Smith and give the science a more concrete form than it had received at the hands of Ricardo; to treat it not merely as an abstract science of the «economic man,» but as «branch of social philosophy, so interlinked with all the other branches that its conclusions are only true conditionally.» The current economist had aroused the antagonism of the working classes. Mathusianism held out a grim prospect of increasing stress with increase of population. Ricardo's presentation of the laws of wages seemed to condemn as absolutely futile all effort to raise wages, whether by voluntary association or by political action. The repeal of the corn laws would, it was feared, ultimately benefit the employers instead of the employed. Mill retained the Mathusian doctrine as one of his cornerstones. He sees hope for the laboring classes only if they will restrict their offspring and thus diminish the supply of labor. He retains also the doctrine that labor is supported by capital, and in his ‹Political Economy› speaks of a «wage fund.» But as an ardent sympathizer with the working class Mill makes various concessions and suggestions which made his work far less a «dismal science.» ‹Political Economy› «has no pretension to the character of a practical guide, apart from other classes of consideration.» While the laws of the production of wealth are real «laws of nature,» the modes of its distribution, «subject to certain conditions, depend on human will.»

The «existing arrangements of society» have much to do with determining what shares fall to laborers, capitalists and landlords, and these arrangements may be altered «by the progress of social improvement.» At first he thought only of getting rid of primogeniture and entails, and of promoting restraint of population by general education. He later came to look for a great advance in co-operation, and in the character which this implies. In 1869 he definitely retracted the «wage-fund doctrine, recognizing that there is a considerable range in the wage which economic conditions allow and hence that trades-unions may raise wages to a certain extent.» In his last years he was especially impressed with the injustice of the places which the landowners occupy at «Malthus's feast.» «Land alone has the privilege of steadily rising in value from natural causes.» The «unearned increment» should be not for the private owner but for the nation. He differed from more complete Socialists in retaining competition in his scheme, and insisting that the associations for co-operation must be voluntary. He regarded the problem of the future to be «how to unite the greatest individual liberty of action, with a common ownership in the raw material of the globe, and an equal participation of all in the benefits of combined labor.»

His moral and political theories are set forth in his ‹Utilitarianism,› ‹Liberty› and ‹Subjection of Women.› He always remained a Utilitarian in the sense that he believed «those actions right which promote the greatest happiness of the greatest number»; further, he attempted to prove this by the individualistic doctrine that since each one desires his own happiness, the general happiness must be a good, not noticing the possible conflict between such happiness-seeking in individuals, which would make a «sum» impossible. But elsewhere he breaks away decisively from Bentham's doctrine that happiness means only pleasure of varying intensity, length, certainty, etc., regardless of what objects produce it. «Higher pleasure,» a «sense of dignity,» will not be exchanged for any amount of the «lower» by the expert judge. It is «better to be Socrates dissatisfied than a pig satisfied.» This is evidently abandoning pleasure pure and simple as standard, and setting up instead a «standard for pleasure,» namely, the character of the man who judges. In the ‹Liberty› he states that the utility which is the ultimate appeal «must be utility in the largest sense, grounded on the permanent interests of man as a progressive being.» The motives on which he relies are not the external «sanctions» of Bentham; nor yet the association of private with public happiness which James Mill had regarded as the structure of conscience. These suddenly appeared to him artificial. Partly under the influence of Comte he came to hold, rather, that conscientious regard for others is supported by natural social instincts. His ‹Liberty,› the most carefully written of his works, contains a fresh and vigorous argument for the principle that only self-protection — to prevent harm to others — justifies society in interfering with the individual's liberty of action. «His own good is not a sufficient warrant.» The positive reason for this is the great value of individuality in human welfare. The principle requires not only liberty from legal restraint, but from the coercion of public opinion. It comprises, first, liberty of thought and discussion, in order that truth may be reached; secondly, liberty of tastes and pursuits; thirdly, freedom to unite for any purpose, not involving harm to others. In the ‹Subjection of Women› he argues for the complete legal equality of men and women, not only to remove injustice but because «the only school of genuine moral sentiment is society between equals.» «We have had the morality of submission, and the morality of chivalry and generosity; the time is now come for the morality of justice.» Moreover, a position of equality with its accompanying effects of enlarged interests, wider responsibility, greater dignity and the possibility of individual development and satisfactions would add immeasurably to the well being of all other members of the family.

Mill's religious views are found chiefly in the ‹Examination of Sir William Hamilton› and in the three essays published after his death. He found no warrant for making nature a standard of morals or for inferring from it perfect benevolence or justice. Indeed only by sacrificing the attribute of omnipotence can we reconcile nature with the existence of a moral deity. In all this he is considering the older deistic conceptions, nature, man and God, as three separate beings. But there is much in his thought which is incompatible with such mechanical separation of nature and spirit, and of human and divine, notably in the famous passage from the ‹Examination.› In reply to Dean Mansel's mode of reconciling supposed divine action with human conceptions of justice by the doctrine that God is Inconceivable, and therefore what is wrong by human standards may be right by divine standards, Mill replies, «I will call no being good, who is not what I mean when I apply that epithet to my fellow creatures; and if such a being can sentence me to hell for not so calling him, to hell I will go.» See MILL, JOHN STUART, AUTOBIOGRAPHY; ON LIBERTY.

Bibliography.—Albee, E., ‹History of English Utilitarianism› (London 1902); Bain, A., ‹J. S. Mill: A Criticism with personal recollections›; Bourne, F., ‹Life of J. S. Mill› (London 1873); Cadman, S. P., «John Stuart Mill» in ‹Charles Darwin and Other English Thinkers› (Boston 1911); Cairnes, J. E., ‹J. S. Mill› (London 1873); Courtney, W. L., ‹Metaphysics of J. S. Mill› (London 1879); and ‹Life of J. S. Mill› (London 1889); Douglas, C., ‹John Stuart Mill, a Study of his Philosophy› (London 1895); Gomperz, T., ‹J. S. Mill› (Vienna 1889); Green, T. H., «The Logic of J. S. Mill» in Green's ‹Works› (Vol. II, London 1886); MacCunn, J., «The Utilitarian Optimism of John Stuart Mill» in ‹Six Radical Thinkers› (New York 1910); Pattison, A. S. P., «English Philosophers and Schools of Philosophy» in ‹Channels of English Literature Series› (New York 1912); Stephen, L., ‹The English Utilitarians› (Vol. III, New York 1900); Watson, J., ‹Comte, Mill, and Spencer› (New York 1895; new ed. revised as ‹An Outline of Philosophy,› Glasgow 1898); Whittaker, T., ‹Comte and Mill› (New York 1909).

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MILL, JOHN STUART, AUTOBIOGRAPHY. This has been called the history of an education, showing what may be accomplished in forming a boy's mind both for good and ill. Mill's teacher was his father, whose ardor in the task was stimulated by the facility of his pupil. He began Greek at three; Latin at eight; by 12 he knew most of the best in both languages, besides reading in English «chiefly histories,» and composing one book in continuation of Pope's 'Iliad.' From 12 he began logic, at 13, political economy, at 17 he was writing articles for the *Westminster Review.* But such forcing of the faculties must be paid for. It was impossible that Mill's education should not produce a distinguished mind, it was equally impossible that it should produce a joyous one. His boyhood lacked games and youthful companionship. At 20, a not unnatural reaction caused a sudden collapse in his whole intellectual outlook, resulting in profound depression, when this brilliant boy «seemed to have nothing left to live for.» From this state of «dry, heavy dejection,» he was roused by the discovery of beauty, art, music and poetry, all of which had been omitted from the system of the elder Mill. Thus he came to perceive the value of feeling and emotion, and was brought back to hope and enjoyment by pleasure in Wordsworth's poetry and the Memoirs of Marmontel. Admirable as all this is, not less so is his account of «that friendship which has been the honor and chief blessing of my existence,» his marriage with Mrs. Taylor in 1851. Mill's intellectual isolation made the experience a vital one; and the words in which he draws his wife's character and their companionship in work and thought are among the most impressive of their kind. Much of the 'Autobiography' is taken up with an account of the genesis and growth of Mill's chief works and with a discussion of his father's character and opinions and of the philosophy of Sir William Hamilton and of Comte. But the book, while primarily intellectual, is not without humanity and warmth, even apart from the glowing passages devoted to the author's wife. Mill's friends, Austin, Maurice, Sterling, the Carlyles and others, come into the human picture as well. The style is admirable for the purpose, clear, dispassionate and not unduly restrained; and the attitude of sane analysis, of modesty and of thoughtful discrimination has never been surpassed in any autobiography. The world has taken the earlier portion of the book — the story of the growth of the boy's mind and character — as its unique contribution to the literature of autobiography; but scarcely less valuable are Mill's pictures of his contemporaries and his analysis of the thought and the social movements of his time.

ANNA ROBESON BURR.

MILL, the general name of a machine for grinding, crushing or pulverizing. Also a lapidary's grinding wheel, known as roughing mill. Also a machine, or complication of engines or machinery, for working up raw material; as, a cotton mill, a spinning mill, a saw mill, an oil mill, etc. In die-sinking, the hardened steel roller having the design in cameo, and used for impressing in intaglio a plate, as in the bank-note system of engraving; or a copper cylinder, as in the process of engraving cylinders for calico printing.

MILL ON THE FLOSS, The. This novel, by George Eliot (Mrs. Marianne Evans Cross), published in 1860, was the second of the long novels of the author, being preceded by the various 'Scenes from Clerical Life' and the novel 'Adam Bede.' It was favorably received on publication and the opening parts, particularly those dealing with the childhood of Tom and Maggie Tulliver, are commonly regarded as among the best work that George Eliot ever did, but the last of the three volumes as originally published was regarded less favorably, largely because of some artificiality of episode and treatment.

In many respects 'The Mill on the Floss' is the most personal of the author's stories. In depicting the heroine she drew to some extent from her own experience, and many of the characters in the book are drawn from people in her own family. The central idea is characteristic of the writing of the author. It is the hopelessness of the attempt of a person of given temperament to accommodate herself to unsympathetic conditions. Maggie Tulliver, a young woman of unusual sensibility and always seeking for happiness, grows up among plain, hard, matter-of-fact people and narrow surroundings. Her volatile temperament causes numerous misunderstandings with her robust and sturdy young brother, Tom, as notably in her forgetting to feed his rabbits during his absence. His partisanship in the feud that had wrecked the fortunes of the Tulliver family and brought about the ruin and death of his father thwarts Maggie's growing love affair with Philip Wakem and later on condemns her for her lack of fairness and firmness in the somewhat artificial episode of Stephen Guest. Meanwhile she has sought consolation in reading 'The Imitation of Christ,' but this, like her family and friends and her affectionate nature, proves a fragile reed. The author, apparently despairing of any possible outcome under such conditions for the happiness of Maggie Tulliver or for her finding even a satisfactory place in the world, drowns her along with her newly-reconciled brother in a somewhat supererogatory flood. The desire of the author was apparently to push the temperament to an inevitable conclusion but the real problem was to account for Maggie had she remained normally alive. The factitious elements which have been spoken of are out of keeping with the general tendency of George Eliot's work, which is to analyze and account for the development of character under less accidental conditions of life. The life of George Eliot by her husband, J. W. Cross, should be referred to.

WILLIAM T. BREWSTER.

MILL SPRINGS, Ky., village in Wayne County, on the Cumberland River, about 90 miles south of Frankfort. It has steamer connections with places on the Cumberland and Ohio rivers. A battle was fought here on 19 Jan. 1862, between the Federal and Confederate forces. (See MILL SPRINGS, BATTLE OF). A National cemetery located here contains 718 graves of soldiers.

MILL SPRINGS, Battle of. The opening of the Kentucky-Tennessee campaign of 1862. At the close of 1861 the Confederate line extended from Columbus, Ky., on the Mississippi, through Fort Henry on the Tennessee, Fort Donelson on the Cumberland, Clarksville, Tenn., and Bowling Green, Ky., to Mill Springs on the Cumberland. Gen. A. S. Johnston was in chief command. Gen. D. C. Buell was the opposing Union commander. Gen. F. K. Zollicoffer established the Confederate right at Mill Springs early in December. Gen. Geo. B. Crittenden took general command there at the middle of the month, with the brigades of Zollicoffer and W. H. Carroll under him. Gen. Leonidas Polk held the Confederate left at Columbus, Gen. J. B. Floyd reached Fort Donelson 13 February, and had under him Generals Pillow, Buckner and Bushrod Johnson. Gen. A. S. Johnston was at Bowling Green, the centre. Gen. Geo. H. Thomas was on the Union left, with General Schoepf immediately opposed to Zollicoffer, while General Buell, with headquarters at Louisville, was in close communication with the Union centre, which threatened Bowling Green and Nashville.

General Zollicoffer, having crossed from Mill Springs to the north bank of the Cumberland and entrenched his position, from which he threatened central Kentucky, General Thomas was sent against his forces, now commanded by General Crittenden, from the direction of Lebanon. On 18 January General Thomas reached Logan's Cross Roads about 10 miles from Crittenden's entrenchments. The latter officer, with the purpose of attacking before Thomas could concentrate his forces, marched at midnight of the 18th with Zollicoffer's and Carroll's brigades, consisting of eight regiments of infantry, six guns and four battalions of cavalry, and attacked General Thomas soon after daylight of 19 January.

The Union troops, consisting of six infantry regiments, one battery and a portion of a cavalry regiment, were brought rapidly into action, both sides fighting with spirit. Finally, when three fresh Union regiments fell on the Confederate right, and the 2d Minnesota was pouring a galling fire upon the centre, the 9th Ohio (German Turners) made a brilliant bayonet charge completely turning the Confederate left, resulting in the Confederate lines breaking and retiring in confusion. At this point General Schoepf's brigade from Somerset reached the field, and the whole force continued in pursuit, reaching the Confederate entrenchments during the night, and forming to assault them at daylight. During the night the Confederates succeeded in crossing their men, leaving artillery, cavalry, horses, mules, wagons, camp equipage and private baggage. The Confederate right wing was effectually broken and largely dispersed.

The overthrow of the Confederate right was followed 6 February by the capture by Admiral Foote, acting in co-operation with General Grant, of Fort Henry on the Tennessee, and 16 February by the capture of Fort Donelson, with its artillery and garrison of about 15,000, by General Grant.

On 8 February General Johnston notified the Secretary of War that the loss of Fort Henry and the movement against Fort Donelson made the Bowling Green line untenable, and that he had directed General Hardee at Bowling Green to prepare to fall back on Nashville. The evacuation was completed 14 February, and by the 17th General Hardee had crossed the Cumberland at Nashville and proceeded toward Murfreesboro. Ten days later, all army supplies having been sent to Chattanooga, which place was held by troops sent by General Bragg from Mobile, Johnston's army marched for the line of the Memphis and Charleston Railroad at Decatur, this line having been decided upon as the next for defense.

By the last of March Johnston's column had taken position at Corinth, Bragg's forces had reached him from Mobile and a portion of Polk's from Columbus.

Meantime (15 February) Bowling Green was occupied by Union forces under O. M. Mitchel. Pressing on, he reached Edgefield opposite Nashville on the 14th. Nelson's division arrived by transports the next day, and soon after the first of March Buell's entire column, coming partly by land and in part by river, was concentrated at Nashville.

The Union movement to Pittsburg Landing began 10 March by the dispatch of Gen. W. T. Sherman's division from Paducah up the Tennessee. It proceeded, under orders of Gen. C. F. Smith, to the vicinity of Eastport; but finding all streams inland at flood, the expedition dropped back to Pittsburg Landing, where it found Hurlbut's division. The latter took post one and one-half miles back 18 February, and Sherman's the next day about three miles back, at Shiloh Church. These were followed within a few days by the divisions of Prentiss, McClernand and W. H. W. Wallace, each selecting its own camp without special reference to a general line, the movement being regarded as a concentration preparatory to an advance on Corinth. Gen. Lew Wallace's division was halted at Crump's Landing, five miles below Pittsburg. General Grant arrived and assumed command 17 March, establishing his headquarters at Savannah nine miles below, on the opposite side of the Tennessee.

General Buell's advance left Nashville 15 March to join General Grant at Savannah. After marching 130 miles in nine days he was stopped by high water in Duck River, necessitating bridging, and then marched the remaining 90 miles in six days. General Grant had advised him that it was not necessary to hurry, as he would not be ready to cross his command over the river till 8 April. However, Buell pushed on and fortunately reached Savannah with the head of his column the night of the 5th. General Johnston, with the design of attacking Grant before Buell could join him, had marched from Corinth 3 April, with the expectation of attacking on the 5th, but heavy rains delayed his columns, and his unexpected attack was delivered soon after daylight of 6 April, thus opening the battle of Shiloh or Pittsburg Landing. See SHILOH, BATTLE OF.

H. V. BOYNTON.

MILL VALLEY, Cal., town, 12 miles north of San Francisco, on the Northwestern Pacific Railroad. Marin County, in which this town is situated, is noted for its beautiful scenery. Mill Valley is in a fine fruit-growing district and owns its waterworks. Pop. 2,550.

MILLAIS, mĭl'lā', Sir **John Everett,** English painter: b. Southampton, England, 8 June 1829; d. London, 13 Aug. 1896. His earliest years were spent in Jersey and at Dinan in France, and at the age of eight he was sent to study art under Mr. Sass in London. In 1840 he became a student in the Royal Academy, and in 1846 he exhibited his ‘Pizarro seizing the Inca of Peru.’ Next year the gold medal of the Academy was awarded to his ‘Young Men of Benjamin seizing their Brides.’ In 1848, along with Holman Hunt, Dante G. Rossetti and others, he founded the Pre-Raphaelite Brotherhood. Among the chief works of this period are ‘A Huguenot,’ ‘The Order of Release’ and the ‘Proscribed Royalist.’ In 1853 he was elected an associate of the Royal Academy, and 10 years later Academician. For a few years thereafter his pictures were still influenced by the Pre-Raphaelite principles, which he gradually abandoned. He developed into a splendid colorist, a master of technique and altogether a great modern master. Numerous honors fell to him; he was decorated with the Legion of Honor in 1878, elected a member of the Académie des Beaux-Arts in 1882, created a baronet in 1885 and elected to succeed Lord Leighton as president of the Royal Academy in 1896; but he only held this last position about six months, dying on 13 August of the same year. He was most successful in figure-pieces and portraits, but he also produced a certain number of landscapes, one of the finest being ‘Chill October’ (1871). He painted portraits of some of the foremost men of the day, including Mr. Gladstone, Lord Beaconsfield, Lord Salisbury, Mr. Ruskin, Lord Tennyson and others. Consult Baldry, A. L., ‘Millais: His Art and Influence’ (London 1899); Bayliss, ‘Five Great Painters of the Victorian Era’ (New York 1902); Hare, T. L., ‘Leaders of English Pre-Raphaelites’ (New York 1909); Millais, J. G., ‘Millais’ Life and Letters’ (London 1899); Reid, J. E., ‘Sir J. E. Millais’ (New York 1909); Spielmann, ‘Millais and His Works’ (London 1898).

MILLAIS, John Gaille, English artist and author, son of Sir John Everett Millais (q.v.): b. London, 24 March 1865. He was educated at Trinity College, Cambridge, and in 1886 entered the 72d Highlanders, retiring with rank as first lieutenant in 1892. He has traveled in Iceland, Africa, western America, Canada, Newfoundland, Norway, Alaska and the Carpathians. He has a museum and a collection of about 3,000 birds, mostly of the British Isles. He has illustrated several books on sport and natural history, among them Seebohm's and Sir R. Payne Gallwey's works, and the ‘Encyclopædia of Sport.’ Author of ‘Game Birds and Shooting Sketches’ (1892); ‘A Breath from the Veldt’ (1895); ‘British Deer and Their Horns’ (1897); ‘Natural History of British Surface’ (1902); ‘British Diving Ducks’ (2 vols., 1913); ‘European Big Game’ (1914); ‘American Big Game’ (1915); ‘Rhododendrous and Their Hybrids’ (1917), etc.

MILLAU, or **MILHAU,** France, city in the department of Aveyron, at the confluence of the Tarn and Dourbie rivers, 74 miles north of Béziers and on the Southern Railway. There is the Romanesque church of Notre Dame, restored in the 16th century; a notable Gothic belfry; and a fine modern church of Saint François. It was the ancient Æmilianum, and in the Middle Ages was the seat of the counts of Barcelona and afterward of the counts of Armagnac. It was a Huguenot stronghold in the 16th century and after its revolt and submission in 1620 its fortifications were leveled by the orders of Richelieu and Louis XIII. The modern town is noted for its manufactures of gloves, and has other leather and woolen industries. It has a trade in wool, wines, skins and Roquefort cheese. Its present prosperity dates from after the Revolution. Pop. about 17,673.

MILLBURY, mĭl'bŭ-rĭ, Mass., town in Worcester County, on the Blackstone River, and on the Boston and Albany and the New York, New Haven and Hartford railroads, about six miles southeast of Worcester. It was settled in 1743 and was called North Parish of Sutton until 1813 when it was incorporated. It is claimed as the place where the «Lyceum Lecture System» originated in 1820. It is a manufacturing town; the chief industrial establishments are foundries, machine-shops, linen cloth factory, woolen mills, thread factories, hosiery mills, lumber mills, weaving machinery and cotton mills. Pop. (1920) 5,652.

MILLEDGE, mĭl'ĕj, **John,** American soldier and politician: b. Savannah, Ga., 1757; d. 9 Feb. 1818. At the outbreak of the Revolution he was one of the party which, led by Joseph Habersham, made a prisoner of Wright, the royal governor, 17 June 1775, the first bold revolutionary act performed in Georgia. When Savannah was taken by the British, Milledge escaped to South Carolina, where he was captured by a party of Americans, and came near being hanged as a spy. In 1779 he was present at the unsuccessful siege of Savannah. He was also at the siege of Augusta, and in South Carolina and Georgia, at various places, did valuable service in the patriot army. In 1780 he was appointed attorney-general of Georgia, and afterward served frequently in the State legislature. In 1802 he was elected governor of Georgia and served two terms. He was a representative in Congress from 1792 to 1802, except one term, and United States senator from 1806 to 1809. Milledge was the principal founder of the University of Georgia, and purchased and presented a tract of land which is the site of the university and of a part of Athens, its seat. See Milledgeville.

MILLEDGEVILLE, mĭl'ĕj-vĭl, Ga., city and county-seat of Baldwin County, on the Oconee River, and on the Georgia and the Central of Georgia railroads, about 30 miles northeast of Macon. It is near the geographical centre of the State; and streams nearby furnish natural drainage and water power. The dam on the Oconee increases the water power. The place was settled in 1803, received its city charter in 1836 and was named in honor of John Milledge (q.v.). From 1807 to 1867 it was the capital of the State. It is in a fertile agricultural region in which cotton, corn, wheat, hay and fruits are the chief products. In the vicinity are fine deposits of talc, kaolin and fire-clay. Ornamental and building brick are manufactured extensively and quantities of clay are shipped to other places. The preparation of cotton for the markets is a most important industry. The building which was once the State capital is now the Georgia Military College, a school with an attendance of over 500 students. Other institutions are the Georgia Normal and Industrial College, a State School for Girls and the State Sanitarium for the Insane. The State prison farm is just outside the city limits. The government is administered under a charter of 1900 and is vested in a mayor, who holds office two years, and a council. The mayor is a member of the council. Pop. (1920) 4,619.

MILLENARIANS. See MILLENNIUM.

MILLENARY, the space of a thousand years; same as MILLENNIUM (q.v.). The word is also used to designate a thousandth anniversary, such as that of the Domesday Book, 12 May 1886; and the commemoration of the death of King Alfred, at Winchester, England, 18–20 Sept. 1901.

MILLENARY PETITION, in English history, a petition named from the number of signatures appended to it presented by the Puritans to James I, in 1603. The petitioners desired to be relieved from the use of the sign of the cross in baptism, the ring in the marriage service, confirmation and bowing at the name of Jesus. The petition in reality contained only 750 names, instead of 1,000.

MILLENNIUM (Lat. *mille,* 1,000, and *annus,* a year), a period of 1,000 years. Hence it is a term applied to the period during which, according to some, Jesus Christ will return to reign on earth before the end of the world. This premillennial appearance of Christ will be signalized by a first or particular resurrection of the just, who are to reign with Him on earth, and by the destruction of Antichrist. Those who hold such views are called millenarians or chiliasts, and their tenet chiliasm (Gr. χίλιοι, 1,000). It is admitted on all sides that these views were, if not general, at least very common in the ancient church. The belief was generally founded on Psalms xc, 4, according to which 1,000 years are before the Lord as one day, compared with the account of the creation as given by Moses. The six days of creation are taken as designating 6,000 years of toil, and the subsequent sabbath as designating 1,000 years of rest and happiness. The millennium was to be the sabbath rest of the new creation of mankind in Christ. Besides these passages, Rev. xxi, 1–6, is especially quoted by chiliasts in support of their views. Chiliasm prevailed chiefly among the Jewish Christians, who retained after their conversion the hope that they would rule over all other nations under a royal Messiah (q.v.). The Ebionites, the Nazarenes and Cerinthians all advocated it and Montanus, and the sect which was called after him, regarded it as a fundamental doctrine of the Christian religion. Some early fathers of the Church also declared themselves generally in favor of the doctrine; Papias, Irenæus and Tertullian were chiliasts; and Papias appealed in support of his view to apostolic traditions. On the other hand, however, the epistles of Clement of Rome and Ignatius of Antioch are silent about it. Justin Martyr who wrote in the 2d century was a believer in the millennium. «I and all Christians whose belief is in every respect correct,» he says, «know that there will be both a resurrection of the flesh and a thousand years in Jerusalem, which will then be rebuilt, adorned and enlarged, as the prophets Ezekiel, Isaiah and others declare.» This view was opposed by the whole Alexandrian school, especially by Origen, who believed in a spiritual supramundane interpretation of Revelations. Still it continued to find advocates during the 3d century, among whom Tertullian, Nepos, bishop of Arsinoe, and Methodius, bishop of Tyre, were prominent. In the 4th century, Jerome, who did not believe in it himself, did not dare to condemn it, in consideration of the many pious and learned advocates it had found in former centuries. Soon after it began to die out; it was temporarily revived toward the close of the 10th century, by the popular belief in the approaching end of the world, but it never regained great strength. The reformation of the 16th century gave a new impulse to chiliasm. Fanatical opinion identified the Pope with Antichrist, and regarded the anticipated downfall of the Roman Catholic Church as foreshadowing the approach of the millennium. But when the Anabaptists undertook in 1534 to erect the new Zion, both the Lutheran and Reformed churches declared themselves against this reversion of the old doctrine. Yet it was preached by many sectarians and theologians of the 16th and 17th centuries, among whom were Weigel and the Moravian bishop Comenius in Germany, Jurieu in France, the Labadists in the Netherlands and Joseph Mede and Jane Lead (d. 1704) in England. A third period in the history of chiliasm may be commenced with the writings of the esteemed exegete and New Testament commentator, Johann Albrecht Bengel. He practically reintroduced it into Protestant theology, where it has ever since been advocated by a number of prominent theologians. The ingenious prelate Oetinger (d. 1782) brought it into connection with his favorite theosophic views. Hahn (the founder of a pietistic sect in Würtemberg), Stilling, Lavater and Hass gave it a wide circulation among the lower classes of the people in Germany and Switzerland. In opposition to the «spiritualism» of modern exegesis, it was advocated, with exegetical arguments, by Hoffmann, Delitzsch, Kurtz, Hebart and others; while Thiersch, Nitzsch, P. Lange and Ebrard supported it from a dogmatical as well as an exegetical standpoint. Swedenborg taught that the last judgment took place in 1757, and that the New Church or church of the New Jerusalem had actually been formed both in heaven and on earth. After Germany, England and America have been the chief fields of modern chiliasm. The «Catholic Apostolic Church,» organized by Edward Irving, laid great stress on the belief that the kingdom of glory was very near. Chiliasm lies at the foundation of Mormonism, whose adherents call themselves «Latter Day Saints» in reference to the near approach of the last day. In the United States great excitement was caused by the preaching of William Miller (q.v.) who sought to prove from the Scriptures that the second advent of Christ would take place about 1843. He not only met with numerous chiliasts in most denominations, but he also founded the sect of Adventists (q.v.). Chiliasm has been seriously taken in declarations of doctrine formulated by several churches. The Augsburg Confession implicitly repudiates it, speaking of «the last days foreshown in Holy Scripture, in which the world is to become ever more and more degenerate and mankind more sinful and weak.» The Council of Trent declares that «the Scriptures also inform us that the General Judgment shall be preceded by the preaching of the Gospel throughout the world, a defection from the faith and the coming of Antichrist.» There is a sort of millennium also looked forward to by those who disbelieve in religion as the renovator of the world. According to these teachers there is a material millennium quite within the range of future possibilities. They teach that the race must look to its renewal and improvement by the non-propagation of disease and impotency of every nature, and to the persistent and joyous multiplication of the best elements of our race, in a continual progress toward the Hierarchy of Life. The millennium, according to this newly invented philosophy, will come by natural and not supernatural means. See ESCHATOLOGY; RESURRECTION; JEWS AND JUDAISM — ZIONISM.

Bibliography.— Beet, J. A., ‹Last Things› (London 1897); Briggs, C. A., ‹The Messiah of the Apostles› (New York 1895); Bonar, H., ‹Prophetical Landmarks› (London 1866); Charles, R. H., ‹Critical History of the Doctrine of the Future Life› (London 1899); Davidson, S., ‹Doctrine of Last Things› (London 1900); Drummond, J., ‹Jewish Messiah› (London 1877); Elliott, E. B., ‹Horæ Apocalypticæ› (London 1862); MacCulloch, ‹Early Christian Visions of the Other World› (Edinburgh 1912); Newton, I., ‹Dissertations on the Prophecies› (London 1755); Salmond, S. D. F., ‹Christian Doctrine of Immortality,› 3d ed. (Edinburgh 1897); Seis, J. A., ‹The Last Times› (2d ed., Philadelphia 1878); Stanton, V. H., ‹The Jewish and Christian Messiah› (Edinburgh 1886); Terry, M. S., ‹Biblical Apocalyptics› (New York 1898).

MILLEPEDE, a myriapod of the *Chilognatha*, the second order of the class *Myriapoda* in which each segment of the body, except a few of the front joints, bears two pairs of legs — the joints in the nearly-related centipedes (q.v.) bearing each one pair only. The common species (genus *Julus*) are found in damp places, concealed under stones, or under the bark of trees. The body consists of from 40 to 50 joints, protected by a horny skin, and when irritated or at rest these animals coil up for protection. The mouth is provided with a pair of strong jaws or «mandibles»; and the antennæ or feelers consist of six or seven joints. See MYRIAPODEA.

MILLEPORE, family (*Milleporidæ*) of *Hydrozoa,* remarkable for secreting massive calcareous skeletons like corals, with which they were for a long time classed. The hydranths are of two kinds: gastrozoids, or feeding polyps, which provide nourishment for the colony, and dactylozoids, which are elongated, mouthless, protective polyps provided with large numbers of nematocysts. The generative cells are remarkable for their wanderings through the tissues of the polyps and colonies. The colonies are hermaphrodite, but the related family *Stylasteridæ* has unisexual colonies. They live in warm seas and form reefs in shallow waters. *Millepora alcicornis* is abundant near low water in the West Indies, where representatives of the *Stylasteridæ* also occur in deep water.

MILLER, Adolph Caspar, American economist: b. San Francisco, Cal., 7 Jan. 1866. He was graduated at the University of California in 1887 and later studied at Harvard, Paris and Munich. He was connected successively with the faculties of Harvard, the University of California and Cornell; was professor of finance at the University of Chicago in 1892–1902, and Flood professor of economics and commerce at the University of California in 1902–13. He served as assistant to the Secretary of the Interior in 1913–14, and has since been a member of the Federal Reserve Board. He is advisory editor of the *Journal of Political Economy.*

MILLER, Charles, American financier: b. Oberhoffen, Alsace, France, 15 July 1843. He came to the United States in 1854, received a common school education and in 1869 entered the oil business. He was for many years president of the Galena-Signal Oil Company — and afterward was chairman of the boards of the American Steel Foundry Company and the American Locomotive Company, serving also as director in some 40 other corporations; and as president of the Lake Erie, Franklin and Clarion Railroad Company. He was mayor of Franklin, Pa., for two terms, served for six years on the Pennsylvania State Board of Charities, and was for five years a major-general in the Pennsylvania national guard. He is active in church work and since 1890 has conducted at his own expense the Miller Night School at Franklin. He is a Chevalier of the French Legion of Honor.

MILLER, Charles Henry, American landscape painter: b. New York City, 20 March 1842; d. Queens, N. Y., 21 Jan. 1922. Graduated from Mount Washington Collegiate Institute, New York, exhibiting his first oil-painting at National Academy of Design, 1860. He received the degree of M.D. from the New York Homeopathic College in 1863, but after his first trip to Europe as surgeon of a ship in 1864 he resolved to devote his life to the fine arts. He studied at the Bavarian Royal Academy with Adolf Lier from 1867 to 1870, when he returned to America. He was president of the New York Arts Club for five years, having become a member of the National Academy of Design in 1875. His paintings are principally landscapes of Long Island. He received the gold medal from Boston and New Orleans international expositions. His best-known work, ‹The Bouquet of Oaks,› is in the Metropolitan Museum. His ‹Sunset, East Hampton› (1878) is in the Brooklyn Museum; ‹High Bridge› hangs in the Democratic Club, New York. He was a lecturer, and author, under the pen name of Carl de Muldor, of ‹The Philosophy of Art in America› (1885).

MILLER, Cincinnatus Heine (better known as JOAQUIN MILLER), American poet, whose pseudonym was due to his defense of Joaquin Murietta, a Mexican bandit: b. Wabash district, Ind., 10 Nov. 1841; d. San Francisco, Cal., 17 Feb. 1913. His father took him to Oregon in 1854. He got a little schooling but soon ran away from home; went to the California gold mines; accompanied Walker on the

Nicaragua filibustering expeditions; lived familiarly among the Indians and the Spaniards of the Pacific slope; studied law for a few years, having graduated at Columbia College, Oregon, in 1858; practised law unsuccessfully in Idaho, where he soon turned express messenger, and in 1863 settled in Oregon for a short time, becoming editor of the Eugene City *Democratic Register,* which was suppressed in the same year because of its treasonable character. In 1864 he began to practise law in Cañon City, Ore., made himself popular by his services against the war-like Snake Indians and from 1866 to 1870 was judge of Grant County. His writings collected under the title ‘Songs of the Sierras’ he could not sell in the East, and so took them to London, where they were published and brought him fame. He visited London again in 1873; lived in Washington, D. C.; and in 1887 returned to California, settling near Oakland. His life sums up the adventure of the Pacific slope, and his verse and fiction are to be prized especially on this account as being real «documents» of certain phases of American life. They are, moreover, fresh, vigorous and original in style; his metre is free and powerful and his narrative forcible. He excels, perhaps, in his pictures of Nature. In a few short lyrics there is a quiet melancholy, bred of communion with solitary wood and mountain. But on the whole he is not a great artist, although his work has a distinct value as descriptive of various American types. Hence his fame has been much greater in England, where he was even styled «the American Byron,» than in America. Miller's verse includes ‘Songs of the Sunlands’ (1873); ‘Songs of the Desert’ (1875); ‘Songs of Italy’ (1878); ‘Collected Poems’ (1882); and ‘Songs of Mexican Seas’ (1887); ‘Building of the City Beautiful’ (1893). His prose works are ‘The Baroness of New York’ (1877); ‘The Danites in the Sierras’ (1881; later in the form of a play); and ‘'49, or the Gold-Seekers of the Sierras’ (1884). An introduction and an autobiography appear in the definitive edition of his ‘Poems’ (6 vols., San Francisco, 1909–10).

MILLER, Edward, American physician: b. Dover, Del., 9 May 1760; d. New York, 17 March 1812. He studied in the hospital at Baskingridge, N. J., was surgeon's mate in the Revolutionary War and in 1784 was graduated from the medical department of the University of Pennsylvania. He practised at Dover in 1783–96, and then established himself in New York. With Dr. Elihu H. Smith and Dr. Samuel L. Mitchell he founded in August 1799 the first American medical periodical, *The Medical Repository.* He was appointed professor of the practice of medicine at the University of New York in 1807, and clinical lecturer at New York Hospital in 1809. He wrote a highly valuable report, ‘Yellow Fever in New York in 1805,’ a paper which is still regarded as authoritative. His other papers were included in the biography written by his brother, Samuel Miller, ‘Memoir and Writings of Edward Miller’ (1814).

MILLER, Ferdinand von, German bronze founder: b. Fürstenfeldbruck, 18 Oct. 1813; d. Munich, 11 Feb. 1887. He studied at the Munich Academy, and under his uncle Stiglmayer, as well as under Soyer in Paris. He executed the castings from the designs of Schwanthaler, and likewise the great statue of Bavaria at Munich and that of Germania in the Niederwald monument. Among a large number of commissions in America perhaps the most notable was that of the capitol doors at Washington, D. C.

MILLER, Ferdinand, Baron von, German sculptor and bronze founder: b. Munich, 8 June 1842. He studied under his father, Ferdinand von Miller (q.v.), and afterward in London, Paris, Berlin, Dresden and Munich. He later traveled in Italy; served in the Franco-Prussian War in 1870–71, with rank of lieutenant; and afterward traveled in the United States. He became a director of the Bavarian Academy of Fine Arts in 1900, and received the title of baron in 1912. His work is well represented in the United States and includes the figure of a soldier for the Soldier's Monument at Charleston; statues of Shakespeare, Columbus and Humbolt at Saint Louis, and the statuary for a magnificent fountain at Cincinnati. He also executed the equestrian statue of Emperor William I, at Metz, and others of King Ludwig I, Prince-Regent Leopold, Prince Friederich-Karl, etc.

MILLER, Florence Fenwick, English doctor, lecturer and author: b. 5 Nov. 1854. She entered the Ladies' Medical College, London, in 1871; gained a wide practice and did much charity work; was thrice a member of the London school board; and is a prominent advocate of women's suffrage. She married Frederick A. Ford in 1877, but kept her maiden name. She wrote ‘The House of Life’ (1879); ‘Physiology for Schools’ (1880); ‘Atlas of Anatomy’ (1880); ‘Readings in Social Economy’ (1883); ‘Life of Harriet Martineau’ (1884); and ‘In Ladies' Company’ (1892).

MILLER, Francis Trevelyan, American journalist and historian: b. Southington, Conn., 8 Oct. 1877. He was graduated from Trinity College, Hartford, 1899; and received the degree of LL.B. from Washington and Lee University in 1901; Hon. Litt.D. from Washington College in 1913; and Hon. LL.D. from the University of Kentucky in 1913. He entered on his journalistic career in 1894 and was connected with various newspapers of the country. From 1907–11, he was editor-in-chief of the *Journal of American History.* He conducted and published numerous sociological investigations of Greater Antilles and contributed short stories, essays and articles to newspapers and magazines throughout the United States. He is the founder and editor-in-chief of the ‘Photographic History of the American Civil War’ (10 vols., New York 1910–11); ‘Travel History of the World’ (18 vols. in process); ‘Photographic History of the Great War’ (1914–15); and has published text-books on geography and history, now in use in New York City schools.

MILLER, Frank Augustus, American innkeeper and antiquarian: b. Tomah, Wis., 3 June 1859. He removed with his parents to California in 1872, and later founded the Glenwood Mission Inn at Riverside, Cal. He has made the inn a careful reproduction of the architecture of the old Spanish missions in America, and has gathered a notable collection of objects connected with the missions of the

18th and early 19th centuries. In 1898 he built the Riverside and Arlington Electric Railway, of which he was manager for 15 years; and he has been active in promoting the growth and public interests of Riverside.

MILLER, George Abram, American mathematician: b. Lynnville, Pa., 31 July 1863. He studied at Muhlenberg College, Pennsylvania, Cumberland University, and at Paris and Leipzig. He was instructor in mathematics at the University of Michigan in 1893–95, and at Cornell in 1897–1901. He was associated with the faculty of Leland Stanford, Jr., University in 1902–06, was associated professor of mathematics at the University of Illinois in 1906–07, and has since been professor of mathematics there. He is editor of the *American Mathematical Monthly* and of *School Science and Mathematics;* and coeditor of the *Encyclopédie des Sciences Mathétiques.* He wrote ‹Determinants› (1892); ‹Historical Introduction to Mathematical Literature› (1915); is co-author of ‹Mathematical Monographs› (1911), and ‹Theory and Application of Groups of Finite Order› (1915).

MILLER, Harriet Mann («OLIVE THORNE MILLER»), American author: b. Auburn, N. Y., 25 June 1831; d. 1918. Her earliest writings were signed «Olive Thorne,» and after her marriage to W. T. Miller in 1849 she added her husband's name to her signature. She began her study of birds in 1880 and has published for young people's reading ‹Little Folks in Feathers and Fur› (1879); ‹In Nesting Time› (1888); ‹Little Brothers of the Art› (1892); ‹A Bird-Lover in the West› (1894); ‹Under the Tree Tops› (1897); ‹The First Book of Birds› (1899); ‹The Second Book of Birds› (1901); ‹True Bird Stories› (1903); ‹What Happened to Barbara› (1907); ‹Harry's Runaway and What Came of It› (1907); ‹The Bird our Brother› (1908); ‹The Child's Book of Birds› (1915).

MILLER, Henry, American physician: b. Lexington, Ky., 1 Nov. 1800; d. Louisville, Ky., 9 Feb. 1874. He was graduated at the Transylvania University, Lexington, Ky., in 1821, and practised for a time in Glasgow and in Harrodsburg. Upon the founding of the Medical Institute, Louisville, Ky., he became its professor of obstetrics and the diseases of women and children, a position he held until he became professor emeritus in 1869. He then occupied a similar chair at the Louisville Medical College until his death. He was author of ‹A Theoretical and Practical Treatise on Human Parturition› (1849), later revised and published as ‹Principles and Practice of Obstetrics› (1858). A partial list of his writings appears in the Surgeon-General's Catalogue, Washington, D. C.

MILLER, Henry (John), American actor: b. London, England, 1 Feb. 1860. He came to America in 1871, received a public school education and made his first appearance on the stage in Toronto. He became a member of Modjeska's company in 1878; played with Adelaide Neilson for two seasons; and appeared at Daly's Theatre, New York, in ‹Odette› in 1882. He appeared as «Herbert» in ‹Young Mrs. Winter› at the Madison Square Theatre; was leading man for Minnie Maddern; and was the leading juvenile of the original Lyceum Theatre Company. He was leading man in the Empire Theatre Stock Company under Charles Frohman; and starred in the original production of ‹Heartsease› in 1896. He was star in ‹The Master› in 1898, and created the leading rôle in ‹The Only Way› in 1899. He opened the Princess Theatre with ‹The Great Divide› in 1906; he was leading man in ‹The Havoc› in 1911, and in ‹Daddy Long-Legs› in 1915, and appeared in ‹The Fountain of Youth› (1918).

MILLER, Hugh, Scottish geologist and author: b. Cromarty, 10 Oct. 1802; d. Portabello, near Edinburgh, 23 Dec. 1856. When five years old he lost his father, a seaman, and thus came under the care of his mother and her two brothers, who were unable to keep him in school, so fond was he of outdoor life, of unrestrained reading and of composition. That he might have the winter months free to write in he choose the trade of a stonemason, at which he worked from 1819 to 1834. He gained some literary repute in the meantime, especially by letters to the *Inverness Courier* on the herring fishery; in 1834 became accountant in the bank at Cromarty; wrote ‹Scenes and Legends of the North of Scotland› (1836); and gradually became known for his knowledge of geology, to the study of which he had first been drawn by noting the ripple marks on a block he was handling in the stonecutters' yard. ‹Old Red Sandstone, or New Walks in Old Fields› (1842) made Miller famous, and the Old Red Sandstone became freshly important to the geologist. Miller was a devout Christian, one of the founders of the «Free Church» of Scotland, and intensely orthodox in his opinions. Hence he opposed the doctrine of development advanced in the anonymous ‹Vestiges of Creation,› and in 1847 published ‹Footprints of the Creator,› to which ‹The Testimony of the Rocks› (1857) formed a sort of sequel. In these books Miller held that, while the Bible is not a scientific textbook and should not be so regarded, yet it is not contradicted by science. In particular, he urged that the narrative of a six-day creation was entirely consonant with modern geological discovery; indeed he divided into six eras, to correspond with these six «days,» all geological history. His interest in the Free Church movement prompted him in 1839 to write ‹A Letter to Lord Brougham› and ‹The Whiggism of the Old School,› in which he protested against the law of patronage and vindicated the right of popular election to pastorates in the Scottish Church. Both pamphlets were so forceful that their author in 1840 was made editor of the *Witness,* an Edinburgh bi-weekly devoted to the cause of ecclesiastical independence. This post he held (with a brief interval) for nearly 17 years, while his health gradually broke under the stonemason's disease contracted years before; at the same time his mind suddenly failed, and in a moment of aberration he shot himself.

Miller's enduring fame may be set down to his admirable, simple and fascinating style. As a scientist he did, it is true, urge the doctrine of specific creation, and emphasize the complete definiteness of demarkation between strata of various geological series and the catastrophic nature of the change from one era to another; but these views were not reactionary at the time, being held by other scientists with far wider and deeper training than Miller. His common sense and native sagacity led him to the correct solution of many minor concrete problems in geology; and his books popularized the study of that science. As a controversialist he was the literary brain of the Free Church. Consult Miller's famous autobiography, ‘My Schools and Schoolmasters’ (1852); Bayne, ‘Life and Letters of Hugh Miller’ (1871); a memoir by Agassiz in the later American editions of ‘Footprints of the Creator,’ and Brown, ‘Labour and Triumph’ (1858).

MILLER, James, American soldier and politician: b. Peterboro, N. H., 25 April 1776; d. Temple, N. H., 7 July 1851. He studied for the bar, but entered the army as major in 1808, and distinguished himself on the northern frontier. In 1812 he was brevetted colonel for bravery as commander at Brownstown, and in the following year participated with credit in the capture of Fort George. In 1814, as colonel of the 21st Infantry, he accompanied the invading army into Canada, and fought with gallantry at the battles of Chippewa and Lundy's Lane (q.v.), the success of the Americans in the latter conflict being mainly due to his capture of a British battery. For these services he was made brigadier-general, and received from Congress a gold medal. In 1819 he resigned his commission in the army, and from that year until 1825 served as governor of the Territory of Arkansas. He was collector of the port of Salem, Mass., from 1825 to 1849, when he retired to private life.

MILLER, Joaquin. See MILLER, CINCINNATUS HEINE.

MILLER, Johann Martin, German novelist and poet: b. Ulm, 3 Dec. 1750; d. 21 June 1814. He was educated at Göttingen and was on terms of intimate friendship with Klopstock, Voss and Hölty. He attained a wide popularity as a writer of lyric verse and of romantic tales. His ‘Siegwart’ (1776), a novel written in the manner of Goethe's ‘Sorrows of Werther,’ was widely popular and was translated into French, Dutch and Polish. His verse was published in the periodicals of his time, ‘Was frag' ich viel nach Geld und Gut’ making an especially wide appeal. His collected verse was published (1783). His further efforts in fiction include ‘Beitrag zur Geschichte der Zärtlichkeit’ (1776); ‘Geschichte Karls von Burgheim und Emiliens von Rosenau’ (1778–79), etc.

MILLER, John Franklin, American soldier: b. South Bend, Ind., 21 Nov. 1831; d. Washington, D. C., 8 March 1886. He graduated at the New York State Law School in 1852 and established a practice at South Bend, and took a leading part in State politics. In 1860 he was elected State senator, but resigned to enter the army the next year. He was in active service from almost the beginning of the Civil War, and in the battle at Stone River he performed services which led to his promotion to the rank of brigadier-general. He resigned at the close of the war though offered a commission as colonel in the regular army, and removed to California, where he for a time practised law and then entered business life. He continued an active interest in politics, and from 1881 until his death was United States senator.

MILLER, Joseph, also known as JOE MILLER, English comedian: b. 1684; d. 1738. For several years he was connected with Drury Lane and was a great favorite in many rôles. In 1739, the year following his death, there appeared a collection of jests under the title ‘Joe Miller's Jests.’ The real compiler was a certain John Mottley, an obscure author (1692–1750).

MILLER, Joseph Nelson, American naval officer: b. Ohio, 22 Nov. 1836; d. Brick Church, N. J., 26 April 1909. He entered the navy in 1851, in 1861 had risen to the rank of lieutenant, and was promoted lieutenant-commander in 1862. As executive officer of the *Passaic* he took part in the attack upon Fort McAllister and Fort Sumter, and in the two attacks upon Fort Fisher as executive officer of the *Monadnock;* and was commended by his commanding officers for bravery and skill in these engagements. In 1870 he was promoted to the rank of commander, and in 1875 was assigned to the *Tuscarora,* and had charge of the deep sea soundings between the Hawaiian and the Fiji Islands. He obtained the rank of captain in 1881, commodore in 1894 and rear-admiral in 1897. In the latter year as commander-in-chief of the Pacific stations he hoisted the American flag at Honolulu, and in 1898 again raised the flag there, when American sovereignty of Hawaii was established. In 1897 he was the representative of the United States navy at Queen Victoria's Jubilee, with the *Brooklyn* as flagship; and during the Spanish War (1898) he organized the naval reserves on the Pacific Coast. He was retired from active service in November 1898.

MILLER, Lewis, American inventor and philanthropist: b. Greentown, Ohio, 1829; d. New York, 17 Feb. 1899. He was a machinist, settled at Canton, Ohio, where he made agricultural tools, many of them after his own designs, notably the first successful reapers and binders; and later had factories at Akron and Mansfield. In Akron he built a model Sunday school, and he gave much money for Sunday school work throughout the country. On his ideas the Chautauqua Assembly was planned and he was its president from 1874 until his death.

MILLER, Nathan L., American jurist and statesman: b. Solon, Cortland County, N. Y., 10 Oct. 1868. He was graduated from Groton (N. Y.) Union School in 1883 and from Cortland Normal School in 1887. He taught school, 1887–92. In 1893 he was admitted to the bar. He was corporation counsel of Cortland, 1901–02; State comptroller, 1902–03; justice of the Supreme Court of New York, sixth judicial district, 10 Nov. 1903 to 1 Jan. 1913; associate justice, Appellate Division, Second Department, 1905–10; First Department, 1910–13; associate judge of the Court of Appeals, 1 Jan. 1913 to 1 Aug. 1915, when he resigned and resumed the practice of law. In 1920 he was elected governor of New York on the Republican ticket.

MILLER, Olive Thorne. See MILLER, HARRIET (MANN).

MILLER, Patrick, Scottish pioneer in steam navigation: b. Glasgow, 1731; d. Dalswinton, Dumfriesshire, 9 Dec. 1815. He was engaged in business as a banker in Edinburgh, and was a leading stockholder in the Carron Iron Company, in whose shops carronades were first manufactured and from which they derived their name. In 1785 he purchased the estate of Dalswinton in Dumfriesshire, and here spent the latter part of his life, devoting his attention to agriculture (he introduced fiorin grass, or white bent, into Scotland, and wrote a treatise on it), and to experiments in shipbuilding. On 14 Oct. 1788 he first demonstrated the possibility of steam navigation by sailing a steam-propelled boat, 25 feet long and 7 broad, on the lake near his house. Miller had Robert Burns at one time as his tenant and correspondent. Consult Woodcroft, ‹Steam Navigation› (1848).

MILLER, Richard E., American artist: b. Saint Louis, Mo., 22 March 1875. He studied at the Saint Louis School of Fine Arts, and at Julien Academy, Paris, and made his first exhibition at the Paris Salon in 1901, receiving the gold medal. He has since received medals at Saint Louis, 1904; Liége, Belgium, 1905; Portland Exposition, 1905; the Temple gold medal of the Pennsylvania Academy of Fine Arts; the Clark prize at the National Academy of Design; Potter Palmer gold medal, Chicago; and the gold medal of honor at the Panama Exposition, 1915. His work is represented in the Luxembourg and other European galleries, and in the Corcoran Gallery, Washington; the Metropolitan Museum, New York; the Pennsylvania Academy of Fine Arts; the Art Institute, Chicago; the Carnegie Institute, Pittsburgh; and other galleries. He is a professor of the École Colorossi, Paris; and in 1906 became a Chevalier of the Legion of Honor. Among his paintings are ‹The Old Maiden Ladies›; ‹Portrait of an Old Woman›; ‹The Boudoir›; ‹The Open Window.›

MILLER, Samuel Freeman, American jurist: b. Richmond, Ky., 5 April 1816; d. Washington, D. C., 13 Oct. 1890. He was graduated from the medical department of Transylvania University in 1838 and engaged in practice, but in 1847 he was admitted to the bar and abandoned medicine. He was an earnest advocate of emancipation of the slaves, and in 1850 freed his own slaves and removed to Keokuk, Iowa, where he established a law practice and changed his political affiliations from the Whig party to the Republican, becoming a party leader in his State. In 1862 he was nominated by President Lincoln to succeed Justice Peter V. Daniels as a justice of the United States Supreme Court, where for many years before his death he was senior justice. He gained a high reputation for ability and force of character and his decisions carried great weight. Among his official opinions was that on the Louisiana slaughter-house cases, defining the respective rights of the State and Federal governments; the Kilbourn-Thompson Case, defining and limiting the authority of Congress as a co-ordinate branch of the government; and his motion as a member of the Electoral Commission in 1877, which resulted in the decision that Congress possessed no authority to go behind the returns of legally accredited State officials. He was selected by the Electoral Commission to prepare its report and to go before Congress to explain its decisions. He was president of the National Conference of the Unitarian Church for three years, and was the principal orator at the centennial celebration of the adoption of the United States Constitution held at Philadelphia in 1887. Author of ‹Lectures on the Constitution of the United States› (1891).

MILLER, Warner, American manufacturer and politician: b. Hannibal, Oswego County, N. Y., 12 Aug. 1838; d. 21 March 1918. He was graduated from Union College in 1860; and for a year was professor of Greek and Latin at the Fort Edward Collegiate Institute. In the Civil War he served in the Fifth New York Cavalry, enlisting as a private, and attaining the rank of lieutenant; he fought under Sheridan, and was taken prisoner at the battle of Winchester, was paroled on the field and afterward honorably discharged. After the war he established a paper manufacturing business, in which he continued to hold large interests. He was also an active member of the Republican party, was delegate to the National Convention in 1872 and was elected to the New York legislature in 1874; and was a member of Congress from 1879 to 1881. In 1881, when T. C. Platt (q.v.) resigned from the United States Senate, Miller was elected to fill the vacancy, serving as senator till 1887; in 1888 he was nominated for governor of New York by the Republicans, but failed of election. Later he was interested in the Nicaragua Canal project, and was president of the Nicaragua Canal Company.

MILLER, Willet Green, Canadian geologist: b. North Walsingham, Ontario, about 1870. He was educated at the universities of Toronto, Chicago, Howard and Heidelberg. He was assistant in field geology in the Canadian Geological Survey in 1891–93; lecturer and subsequently professor of geology at Queen's University, Kingston, in 1893–1902; and has since been provincial geologist and inspector of mines for Ontario. He had charge of the field work for the Eastern Ontario Bureau of Mines in 1897–1901, and was president of the Canadian Mining Institute in 1908–10. He was a member of the Ontario Nickel Commission in 1915–16; and since 1918 has been Canadian Representative on the Imperial Mineral Resources Bureau. He is author of numerous papers on the pre-Cambrian and economic geology of Ontario; corundum-bearing rocks, iron ores, gold deposits, cobalt-silver ores and kindred subjects, and of ‹Minerals and How They Occur› (1906).

MILLER, William, American religious leader: b. Pittsfield, Mass., 5 Feb. 1782; d. Low Hampton, Washington County, N. Y., 20 Dec. 1849. Most of his education he obtained through books procured by wood-chopping. He became a farmer at Poultney, Vt., in 1803, and in 1816 removed to Low Hampton, N. Y. In the War of 1812 he was captain of a company organized to protect the northern frontier. He was at first a student of Hume, Voltaire, Thomas Paine and Ethan Allen, and an avowed deist; but afterward became a member of the Baptist church at Low Hampton. After a prolonged study of the Bible, enlightened by no help excepting that of a concordance, he began in 1831 to preach the second advent of Christ. He was licensed as a preacher by the church at Low Hampton, but was never ordained. For a time all pulpits except the Roman Catholic and Episcopalian welcomed him. He first set the time of the second coming as somewhere between 21 March 1843 and 21 March 1844, and on 14 March 1844 proclaimed it as near at hand. Months intervened and then in October the faithful gathered in their assemblies. At the end of November they dispersed. Many of the Second Adventists, or Millerites, as they were sometimes called, affiliated with other sects, but about 50,000 remained under the direction of Miller, who, on 25 April 1845, called a convention by which a declaration of faith was adopted, and the name of «Adventist» selected for the sect, which increased in numbers, and is to-day divided among six branches. Miller assisted in establishing in 1840 *The Signs of the Times and Exposition of Prophecy*, later called the *Advent Herald*. He published ‹Evidence from Scripture and History of the Second Coming of Christ about the year 1843 . . . in a Course of Lectures› (1842); a widely-circulated ‹Dream of the Last Day› and other writings. Consult the biographies by Bliss (1853) and White (1875). See Adventists; Millennium.

MILLER, William, English soldier: b. Wingham, Kent, 2 Dec. 1795; d. on H. M. S. *Naiad*, Callao Harbor, Peru, 31 Oct. 1861. He entered the field train department of the British artillery and was appointed assistant commissary in 1811. He served with Wellington's army in the Peninsula campaigns in 1811–14, and later saw service in the war against the United States in the operations about the Chesapeake and New Orleans. After the peace he traveled in Europe for two years and then went to South America. He joined the army of Chile in its struggle for independence, and later commanded the marines on the *O'Higgins*. He became a general of brigade in the Peruvian army in 1823 and attained rank of general of division and commander-in-chief of cavalry under Bolivar, rendering important service at the decisive battle of Ayacucho in 1824. He was appointed governor of Potosi in 1825. In 1826 he returned to Europe, but returning to Peru in 1830 he filled various important positions until 1839, when changes in political control caused his banishment. He was appointed British consul-general in the Pacific in 1843 and died while on a mission to the Peruvian government. Consult Miller, J., ‹Memoirs of General Miller› (2 vols., London 1829).

MILLER, William, English line engraver: b. Edinburgh, 28 May 1796; d. Sheffield, 20 Jan. 1882. He was educated in England and at the University of Edinburgh, and studied engraving at Edinburgh and also under George Cooke during a residence in London, after which he returned and settled in his native city. His work was much commended by J. M. W. Turner, and he engraved many plates after and in accordance with the suggestions of that master. Of these the most important are ‹The Bass Rock in a Storm› (1826); ‹Great Yarmouth› (1829); ‹The Grand Canal, Venice› (1837); ‹Modern Italy› (1849); ‹The Bell Rock Lighthouse in a Storm› (1864); ‹Saint Michael's Mount› (1866). The chief features in his engravings are the remarkable skill with which he gives the tone and value of color effects in black and white; the boldness and freedom with the line is employed in expressing the movement and gloom of storm clouds, the transparent fluidity of tossing waves and the glassy surface of still rivers. He was remarkably successful in book illustrations, of which fine examples may be seen in the Abbotsford edition of the Waverly Novels.

MILLER, William, Scottish poet: b. Bridgegate, Glasgow, August 1810; d. Glasgow, 20 Aug. 1872. Uncertain health preventing his becoming a physician, he adopted the trade of wood-turning. He published ‹Whistle Binkie› (1852–53) and ‹Scottish Nursery Songs and Other Poems› (1863), which earned for him the title of the «Laureate of the Nursery.» One of his most popular poems is ‹Wee Willie Winkie.›

MILLER, William, Canadian statesman: b. Antigonish, Nova Scotia, 12 Feb. 1834; d. 25 Feb. 1912. He was educated at the Antigonish Academy, was called to the bar of Nova Scotia in 1860 and became queen's counsel in 1872. He served in the Nova Scotia assembly in 1863–67 and was a staunch supporter of the projected Confederation, although certain features, particularly the financial plan, were opposed by him. Largely through his efforts a compromise was effected which secured the adherence of Nova Scotia and the appointment of the delegates to London in 1866. He served in the Senate from 1867 until his death, and in 1883–87 he was speaker. He served on many important committees and was chairman of the Parliamentary committee for the codification of the Dominion's criminal law. He declined judicial appointments from both Alexander Mackenzie and Sir John Macdonald. He became a privy councillor for Canada in 1891.

MILLER, William Hallowes, English mineralogist: b. Velindre, near Llandovery, Carmarthenshire, 6 April 1801; d. Cambridge, 20 May 1880. He was graduated at Saint John's College, Cambridge, in 1826, was elected a Fellow there in 1829, and in 1832 he was appointed professor of mineralogy, which position he occupied until 1870. His system of crystallography was published in 1838 and received prompt recognition for its great worth, a reputation it still retains. He was one of the committee appointed in 1843 for the purpose of restoring the standards of weight and length, which were destroyed when the Houses of Parliament burned in 1834. His report of the work appears in the ‹Philosophical Transactions› (1856). In 1870 he was appointed to the Commission International du Mètre, where he rendered valuable service. He was elected to the Royal Society in 1838, was its foreign secretary in 1856–73 and received a royal medal in 1870. He was also a knight of the orders of Saint Maurice and Saint Lazare in Italy, and of Leopold in Belgium, and was a corresponding member of the French Academy. He was author of treatises on hydrostatics and hydrodynamics, contributed 45 papers to the ‹Royal Society's Catalogue,› as well as writing for other scientific publications, and edited William Phillips' ‹Elementary Introduction to Mineralogy› (1852).

MILLER, William Henry Harrison, American jurist: b. Augusta, N. Y., 6 Sept. 1840; d. 25 May 1917. He was graduated from Hamilton College, Clinton, N. Y., in 1861 and in 1862 entered the army, serving through the war. He engaged in law practice in Fort Wayne, Ind., 1866–74; in 1874 removed to Indianapolis and formed a partnership with Benjamin Harrison, and under the latter's administration (1889–93) was Attorney-General of the United States.

MILLER, William Lash, Canadian chemist: b. Toronto, about 1865. He was educated at the universities of Toronto and Munich, and became demonstrator in chemistry at Toronto. Since 1907 he has been professor of physical chemistry there. He is a member of the American Association for the Advancement of Science, a Fellow of the Royal Society of Canada and author of numerous technical papers.

MILLER, Fort, a former fortification on the site of the present village of Fort Miller, Washington County, N. Y., on the Hudson River, 40 miles north of Albany.

MILLERAND, Alexandre, French lawyer and statesman: b. Paris, 10 Feb. 1859. He was educated at the Lycée Vanves, the Lycée Henri IV and at the University of Paris, where he studied for the bar. He established his reputation when he acted as a member of counsel for the defense of the strikers at Montceau-des-Mines in 1882. In politics he was a radical Socialist and as such he was elected to the Camber of Deputies in 1885, advocating collective ownership of production, and international unions of labor. He was, with Clemenceau, one of the arbitrators of the Carmaux strike in 1892. He had owned and edited *La Voix* from 1889, and he later edited *La Petite République,* the organ of the Socialists. In 1899 he was appointed Minister of Commerce in the Waldeck-Rousseau Cabinet, after which time he abandoned his extreme views and bent his energies toward encompassing certain practical reforms. Among them were improvements in the merchant marine; stimulation of trade; reforms in postal service; the establishment of a 10-hour working-day for women and children; an eight-hour day for miners; and the inauguration of one rest day a week for workers. He also endeavored to secure an enforcement of arbitration in labor disputes. He was an advocate of old age pensions, the law for which was passed in 1905; and he was responsible for the institution of separate departments for the direction of labor, insurance and pensions. His influence with the Socialists waned and his connection with the party was severed because of his entering the cabinet of an opposing party. In 1898 he became editor of *La Lanterne* and in 1902 the Waldeck-Rousseau Cabinet was dissolved. He served in Briand's Cabinet as Minister of Public Works in 1909–10, and was Minister of War under Poincaré in 1912–13. On the organization of the war cabinet under Viviani, 26 Aug. 1914, he was again appointed Minister of War. He was criticized for lack of vigor in prosecuting the war and in the cabinet organized by Briand 31 Oct. 1915 he was succeeded by General Galliéni, whereupon he resumed his law practice, but continued in active service in the Chamber of Deputies. He was designated to attend the War Conference at London 20 Jan. 1916. In September 1920 he succeeded Paul Deschanel as President of France. He wrote ‹Socialisme Reformiste en France› (1903); ‹Travail et Travailleurs› (1906); ‹The Charitable Efforts of the United States› (1917); ‹La guerre litératricé› (1918), etc.

MILLERITE (named in honor of W. H. Miller (q.v.), and formerly known as *hair pyrites* and as *capillary pyrites*), a mineral consisting of nickel sulphide; of bronze color and having a metallic lustre. It occurs in tufts of capillary crystals and in incrustations of delicate fibres loosely interwoven. It is found at Merthyr Tydvil, South Wales; in Cornwall, England; Saxony and Bohemia; in Sherbrooke County, Quebec; Jefferson County, N. Y.; Lancaster County, Pa.; and in Missouri and Wisconsin.

MILLER'S TALE OF THE CARPENTER, The, one of Chaucer's ‹Canterbury Tales› (1475). It records the deception practised on an old husband, a carpenter of Oxford, by his young wife and a clerk who lodges with them. The source of the tale is unknown.

MILLER'S-THUMB, the English name for a spiny fresh-water goby (*Cottus gobio*), of which many species occur in Europe and elsewhere. It seldom exceeds three or four inches in length, the fins are large, the flesh delicate and when boiled of a salmon color. They are frequently called «bullheads» (q.v.), but are different from the small American catfish so called. Consult Gill, T. M., ‹Miller's-thumb and Its Habits› (Smithsonian Institution Miscellaneous Collections, Washington 1910).

MILLERSBURG, mĭl'ėrz-bėrg, Ohio, village, county-seat of Holmes County, on Killbuck Creek and on the Cleveland, Akron and Columbus, and the Baltimore and Ohio railroads, about 70 miles northeast of Columbus. It is a manufacturing village; its principal industrial establishments are flour and lumber mills, foundry, brick yards and machine shops, and its waterworks are municipally owned. In the vicinity are deposits of iron ore and bituminous coal. Pop. 2,020.

MILLES, Ruth Anna Maria, Swedish sculptor, sister of Vilhelm Karl Emil Andersson Milles (q.v.): b. Vallentuna, Uppland, 10 Feb. 1873. She studied at Stockholm and at Paris and is known for the delicacy and elegance of her statuettes, groups, bas-reliefs. Among her works are ‹Red Riding-hood and the Wolf› (1902); ‹Fisherman's Wife›; ‹Yvonne,› ‹Wildflower,› ‹After Waiting,› National Museum (1907), etc.

MILLES, Vilhelm Karl Emil Andersson, Swedish sculptor: b. Lagga, near Upsala, 23 June 1875. He studied at Stockholm and at Paris and early gained a reputation as a sculptor of great promise. His work is chiefly in bronze and has placed him in the foremost ranks of Swedish sculptors. Among them are the Sten Sture monument, near Upsala, executed in 1901; portrait busts of Julius Kronberg, in the Göteborgs Museum (1902); Professor Mittag-Leffler (1904); F. Boberg, National Museum (1906); O. Leventin (1910), and G. Stridsberg, National Museum (1910); numerous groups of animals in granite and in bronze, the Scheele statue at Köpings (1912), etc.

MILLET, Aimé, ā-mā mē-lā, French sculptor: b. Paris, 1816; d. there, 14 Jan. 1891. He studied art under David d'Angers (see DAVID, PIERRE JEAN), and the architect Viollet-le-Duc (q.v.), applied himself first to painting and exhibited a picture in the exhibition of 1842, toiling at the easel for 10 years with no success. He meanwhile had turned his attention to the plastic arts and exhibited his first statue, a ‘Bacchante,’ in 1845. This was followed by his ‘Ariadne’ (now in the Luxembourg), a ‘Mercury’ and a statue of ‘Civic Justice’ for the mairie of the First Arrondissement, Paris; the statue of a ‘Young Girl’ for a monument in the cemetery of Montmartre, an ‘Apollo’ for the façade of the New Opera House and a bronze statue of ‘Vercingetorix’ (1865). Among his portrait and personal works are the statues of Chateaubriand at Saint Malo; of Denis Papin, at Blois, and numerous busts. His style has all the realism of modern French sculpture, combined with a certain theatrical demonstrativeness, a vividness of expression, pathetic, tragic or passionate. Consult Dumesnil, ‘Aimé Millet, Souvenirs Intimes’ (Paris 1891).

MILLET, Francis Davis, American artist, author, war correspondent and illustrator: b. Mattapoiset, Mass., 3 Nov. 1846; d. 15 April 1912, one of the victims of the *Titanic* steamship disaster. During the Civil War he acted as drummer and assistant surgeon. In 1869 he was graduated A.B. and A.M. in 1872 at Harvard University. While contributing and illustrating special articles for American publications he studied, in 1871–72 at the Royal Academy of Fine Arts, Antwerp, and in France and in Italy. In 1877–78 he was official correspondent for the New York *Herald,* the London *Graphic* and the London *Daily News* during the Russo-Turkish War, receiving Russian and Rumanian medals and decorations for bravery. In 1885 he was elected to the National Academy of Design, later to the American Academy of Arts and Letters, and was made an honorary member of the American Institute of Architects. He was awarded medals for pictures exhibited in 1889 at Paris, in 1893 at Chicago where he was in charge of the decorations and functions in connection with the World's Fair, and in 1901 at Buffalo. In 1898 he was correspondent for the London *Times* and *Harper's Weekly* in the Philippines. In 1905–06 he was actively engaged in organizing and securing endowment for the American Academy at Rome, of which he was elected the first secretary. Among his best-known paintings are ‘An Old-Time Melody’ and ‘A Cozy Corner’ in the Metropolitan Museum, also ‘At the Inn’ in the Union League Club, New York city; ‘Between Two Fires’ in the National Gallery of British Art, London. Portraiture includes paintings of Nicholas Murray Butler, president of Columbia University, and of Mrs. Millet. His best-known works are his five mural paintings, notably the ‘Evolution of Navigation’ in the Baltimore (Md.) Custom-house, and those in the Essex County Courthouse, Newark, N. J.; the Hudson County Courthouse, Jersey City, N. J.; the Cleveland, Ohio, post office; the Supreme Court at Madison, Wis., and in the Minnesota State Capitol. Besides his numerous contributions to periodical literature his published books include ‘Capillary Crime and Other Stories’ (1892); ‘The Danube’ (1892); ‘The Expedition to the Philippines’ (1899). With Maj. Archibald W. Butt, another victim of the *Titanic* disaster, he is commemorated by a memorial fountain erected in 1913 in Washington, D. C.

MILLET, Jean François, zhŏṅ fräṅ-swä mē-lā, French painter, the founder of the Barbizon school of painting: b. Gruchy, near Cherbourg, 4 Oct. 1814; d. Barbizon, 20 Jan. 1875. The son of a Norman peasant, he owed much in his childhood to a woman of simple piety and strong individuality, and to her brother, and learned enough Latin to delight in the Vulgate and Virgil. He was educated in the Academy of Design at Cherbourg, and received a bursary from that city which enabled him, in 1837, to proceed to Paris, where he entered the studio of Delaroche. This does not seem to have been a congenial home for his early art life, yet at first he struggled to comply with his surroundings and painted genres in the style of Watteau (q.v.) and Boucher (see BOUCHER, FRANÇOIS), as well as Biblical and mythological incidents, with landscape backgrounds, and signboards. It was in 1848 that he really found himself, and hit upon the line of art in which he could give utterance to the sincere feelings of his heart. This turning point in his career was marked by the appearance of his genre painting, taken from country life, ‘The Winnower.’ Henceforth his days were to be spent far from the glitter of Paris, the competition and jealousies of the studios; settling in Barbizon, on the edge of the forest of Fontainebleau, he devoted himself to the study and portrayal of peasant life. The hardship, toil and privation of the farm laborers he sympathized with acutely, and some have even accused him of being a social revolutionist, but he professed no views of this tendency, though his interpretation of the peasant's lot may be too gloomy and pessimistic, and his ironical bitterness of spirit such that it infected his canvas and clouded the beauty of external nature as depicted there. He himself was almost all his life battling with that poverty whose privations had early robbed him of his young wife. There is a profound pathos in his conception of the rural isolation and hardship of soil slavery, with all its stolid but unrequited patience, and this he has portrayed with a certain broad and impressionistic treatment which is both sincere and original. At first, his works were passed by or misunderstood, but gradually they were recognized at their true value, and he was hailed as the greatest painter of modern France. Since his death his pictures have been sold at enormous prices and are looked upon as the most precious pieces in private or public collections.

Millet's greatest picture, the ‘Angelus’ (1859), was sold by him for 1,800 francs and later brought at auction 800,000 francs. Millet himself sold his picture ‘The Woman with the Lamp’ for $2,800 in 1872. Shortly after it was sold for $4,600 and again for $7,000. In 1882 it fetched $18,000. The most important of his other works are ‘The Sower’ (1850); ‘Man Spreading Manure’ (1852); ‘The Reapers’

(1853); ‹The Gleaners› (1857, in the Louvre); ‹Death and the Woodcutter›; ‹La Becquée› (Feeding Her Birds)— a mother feeding her three children from the same bowl. These all belong to his early period when he was tortured with sickness and harassed by debt. After the appearance of the ‹Angelus› his reputation was established, but chronic poverty still pursued him. In 1860 he produced his wonderful picture, the ‹Sheep-Shearing› in which he seems to express as much pity for the dumb beast as for the patience of the human toiler who is bent over it. In 1862 appeared the ‹Potato Planters›; in 1863 ‹The Wool Carder,› and ‹The Man with the Hoe.› In 1867 he was awarded at the Paris Exposition a medal of the first class and the ribbon of the Legion of Honor in 1868. He took refuge in Cherbourg during the Franco-Prussian War, but returned to Barbizon in 1871, where he continued in broken health, though still working with untiring brush, until the end came.

Among the paintings of this artist now in the United States are ‹The Sower›; ‹The Water Carrier› (Vanderbilt collection); ‹A Peasant Grafting a Tree› (Rockefeller collection); ‹The Turkey Tender› (C. A. Dana collection, New York); ‹The Buckwheat Threshers› and the ‹Potato Planters› (Quincy Shaw collection, Boston); ‹Harvesters Resting› and ‹Homestead at Gréville› (Boston Art Museum); ‹The Churners› (F. L. Ames collection); ‹Potato Diggers› and ‹Breaking Flax› (Walters collection); ‹The Man with the Hoe› (San Francisco Museum).

The drawings, etchings and pastels of Millet are eagerly sought after and always bring a high price at auction or private sale. The most familiar is his own portrait, a sketch often reproduced. His ‹Woman Feeding Chickens› ‹Flock of Sheep with Shepherd›; the ‹Newborn Lamb›; ‹Laundresses on the Shore› are best known. Among his pastels are ‹The Vine Dresser› and ‹Butter Making.› All his works show masterly drawing, and the landscapes which appear in many of them are put in with an ease and atmosphere worthy of the best periods of French art. His coloring may be sombre, and he disregards the power of the human countenance as giving expression to the sentiment of his conception. But the life of each picture is to be found in the inimitable pose of the figures, and the suggestiveness of the background. The hands, shoulders and feet of these figures, as they move in harmony with forms cumbrous, almost grotesque, are made to suggest the dull torture in which stolid and half-bestial creatures are held under the yoke of toil and poverty. The light reflected upon these figures from religious sentiment or natural affection only serves to intensify the profound melancholy by which the story of their lives is clouded.

Bibliography.— Ady, J. C., ‹Jean François Millet: His Life and Letters› (New York 1902); Marcel, H., ‹Jean François Millet: biographie critique› (Paris 1903); Sensier, ‹La vie et l'œuvres de Jean François Millet› (Paris 1881); and its abridged English translation (Boston 1896); Thomson, D. C., ‹The Barbizon School› (London 1890); Turner, Percy M., ‹Millet› (in the ‹Masterpieces of Color› series, London 1909); Yriarte, C. E., ‹Jean François Millet› (Paris 1885).

MILLET, or MILET, Pierre, French-Canadian pioneer missionary: b. Bourges, France, 1635; d. Quebec, Canada, 31 Dec. 1708. He entered the Jesuit order and in 1667 went to Canada. In 1668 he was sent as missionary to the Iroquois in New York and in 1671 he was placed at the head of the Oneida mission. He succeeded in converting the principal chief and slowly gathered a congregation of considerable proportions. In 1684 he left his work among the Oneidas to accompany De La Barre in his campaign against the Senecas, and he served as interpreter between the Iroquois and the French at Frontenac in 1686. He was stationed at Fort Niagara in 1687 and afterward at Frontenac, in the hope that his experience among the Iroquois might enable him to promote friendly relations between them and the French. During the siege of Frontenac in 1689 he was captured by the Onondagas, who after maltreating him gave him over to the Oneidas. There he was sentenced to the stake but was finally rescued by an Indian convert who succeeded in having him adopted into the tribe. In 1694 he was permitted to return to Quebec, and afterward was petitioned by the Oneidas to return to them. From 1697–1703 he was missionary at Sault-Saint Louis.

MILLET, a popular name for many grasses grown in the Old World as cereals, but in the New almost wholly as forage. The principal ones are true or broomcorn millet (*Panicum milaceum*); foxtail millet (*Setaria italica*); barnyard or Japanese (*Panicum crus-galli*); pearl or cat-tail millet (*Pennisetum typhoideum*) and the African, Chinese, Indian, black and erroneously called «pearl millet» (*Sorghum vulgare*). Sometimes *Elusine coracana* is called African millet. In general they constitute one of the most important groups of food-plants, since they are the staple diet of about one-third of the world's population, the annual plantation in India alone being estimated at approximately 35,000,000 acres. The first three mentioned are the most important groups grown in the United States. The plants all thrive well upon rather light, well-drained soils, which should be prepared as for other cereal crops. In order to make a millet harvest succeed the harvest of other cereals, the seed is sown late in the spring. Broadcasting and drilling are both practised, the latter more extensively. Just after blossoming, the crop may be cut and cured for hay; for seed, just before the seed becomes fully mature to prevent loss from shattering. The hay makes valuable fodder, but some stockmen attribute various animal ailments to its excessive or exclusive use; others experience no such difficulties. The seed may be ground for stock food, but it is little used. For poultry, especially for young chicks, it is widely employed.

MILLIGAN, George, Scottish educator and clergyman: b. about 1860. He was educated at the universities of Aberdeen, Edinburgh, Göttingen and Bonn, and was afterward minister of Saint Matthews, Morningside, and of Caputh. Since 1910 he has been regius professor of divinity and religious criticism at Glasgow University, and he has served as clerk of the senate since 1911. Author of ‹History of the English Bible› (1895); ‹The Theology of the Epistle to the Hebrews› (1899); ‹The

New Testament Documents: Their Origin and Early History' (1912); coauthor, 'The Vocabulary of the Greek Testament' (Parts I and II, 1914–15), etc.

MILLIGAN, Robert Wiley, American rear-admiral: b. Philadelphia, 8 April 1843; d. 14 Oct. 1909. He entered the navy with rank as third assistant engineer and was attached to the United States steamship *Mackinaw* in the North Atlantic Blockading Squadron during the Civil War. He saw service at both battles of Fort Fisher, and was present at the fall of Wilmington, N. C., and of Petersburg and Richmond, Va. He afterward served in the North and South Atlantic and Pacific squadrons, and was on duty as instructor at the United States Naval Academy. He was promoted chief engineer in 1892, in which capacity he served on the United States battleship *Oregon* on her famous run from the Pacific to the Atlantic coast in the Spanish-American War, and also served at the battle of Santiago. He was fleet engineer of the North Atlantic Fleet, on the flagship *New York,* for one year; was promoted commander in 1899 and was chief engineer of the Norfolk navy yard in 1899–1905. He received rank as captain in 1902 and was retired with rank as rear-admiral in 1905.

MILLIGAN, William, Scottish Presbyterian clergyman and commentator: b. Edinburgh, 15 March 1821; d. Edinburgh, 11 Dec. 1893. He was educated at the University of Saint Andrew's, entered the ministry of the Established Church of Scotland, held pastorates at Cameron and Kilconquhar and was professor of Biblical criticism in the University of Aberdeen from 1860. He was moderator of the General Assembly in 1882, and was appointed principal clerk to the assembly in 1886. He was one of the revisers of the New Testament and the author of 'The Higher Education of Women' (1878); 'The Resurrection of Our Lord' (1881); 'Commentary on the Revelation' (1883); 'The Resurrection of the Dead' (1890), etc. He visited the United States in 1872 as a delegate to the Presbyterian General Assembly from the General Assembly of the Scottish Church.

MILLIGAN, Ex Parte, a decision handed down by the Supreme Court of the United States in 1866 holding a military commission to be without power in a State not invaded nor in rebellion, and where the usual civil courts, both Federal and State, were open; rendered by a barely sufficient majority, with Chief Justice Chase and Justices Wayne, Swayne and Miller dissenting, and Chief Justice Chase pronouncing a forcible protest. The case was that of one Lambdin P. Milligan, a United States citizen residing in Indiana, arrested by military authorities in 1864 on a charge of conspiracy, disloyal practices, inciting insurrection and aiding and comforting the enemy. He was found guilty by a military commission and sentenced to death. His counsel filed a writ of habeas corpus in the United States Circuit Court and the case eventually was carried to the Supreme Court, where the military commission was held to be without jurisdiction in his case. Chief Justice Chase asserted that the power of Congress «to authorize trials for crimes against the security and safety of the national forces, may be derived from its constitutional power to raise and support armies and to declare war»; and that while the civil courts «might be open and undisturbed in their functions . . . yet wholly incompetent to avert threatened danger, or to punish, with adequate promptitude and certainity, the guilty conspirators.» Consult 'Wallace's Reports of the Supreme Court of the United States' (Vol. IV, 1866).

MILLIGAN COLLEGE, in Milligan, Tenn., a coeducational institution founded in 1882 by Josephus Hepwood, under the auspices of the Disciples of Christ. It has a preparatory department and a college department; the courses lead to the degrees of A.B., B.S. and Ph.B. In 1915 there were connected with the school 14 professors and over 170 students. The library contained about 3,000 volumes. The grounds and buildings were valued at $75,000, and the income was about $14,000.

MILLIGRAM, the thousandth part of a gram. See WEIGHTS AND MEASURES.

MILLIKEN UNIVERSITY. See JAMES MILLIKEN UNIVERSITY.

MILLIKEN'S BEND, Engagement at. Milliken's Bend, La., on the west bank of the Mississippi, about 15 miles above Vicksburg, was the base of some of the military operations against that place and the lower Mississippi. Early in June 1863, when Grant was besieging Vicksburg from the east, Gen. E. Kirby Smith, commanding the Confederate Department of the Trans-Mississippi, sent Gen. J. G. Walker's division of 4,000 men to seize the place and other points on the river, and open communication with General Pemberton, in Vicksburg, with the object of furnishing him supplies, or failing in that, to cover his escape across the river. Walker moved to Alexandria, La., and reported to Gen. R. Taylor, commanding in West Louisiana, and was sent in transports up the Washita and Tensas rivers, until abreast of Vicksburg, when he landed and marched across to Richmond. At this time Milliken's Bend was held by Gen. E. S. Dennis, with about 1,400 men, mostly colored troops. A reconnoitring party sent out by Dennis was driven back by the Confederates. Walker arrived at Richmond at 10 A.M. on the 6th, and was ordered by Taylor to send one brigade to Young's Point and one to Milliken's Bend, distant respectively 20 and 10 miles, and to hold a third brigade in reserve six miles in advance of Richmond. Harris' brigade moved at night on Young's Point, was delayed and accomplished nothing. Gen. H. E. McCulloch, with a Texas brigade of 1,600 men and 200 cavalry, marched from Richmond at 6 P.M. on the 6th and at 3 A.M. on the 7th, when within one and a half miles of Milliken's Bend, the Union skirmishers were encountered and the Confederate advance driven back in some disorder; but McCulloch rallied his men and pushed on, driving the Union troops back slowly to their main line, carrying the Union breastworks, then driving the Union troops to the bank of the river, where two gunboats came to their assistance and, pouring shells into the ranks of the Confederates, obliged them to withdraw and return to Richmond. The Union loss was 127 killed, 287 wounded and 266 missing; the Confederates lost 44 killed, 131 wounded and 10 missing. Consult ‹Official Records› (Vol. XXIV).

MILLIKIN, James, American banker and philanthropist: b. Pennsylvania, 2 Aug. 1830; d. Orlando, Fla., 2 March 1909. In 1860 he engaged in banking and later founded the firm of Milliken and Company at Decatur, Ill., now the Milliken National Bank. He is president of the Union Works. He founded the Anna B. Millikin Home, an institution for the care of aged women and children, built and supported mostly by him, and named by the board of directors after his wife, Anna B. Millikin. He also founded the James Millikin University, dedicated in 1904 by President Roosevelt.

MILLIN, Aubin Louis, French antiquary and naturalist: b. Paris, 19 July 1759; d. there, 14 Aug. 1818. He was destined for the priesthood but preferring to devote himself to literature he entered the Royal Library. His sympathies in the Revolution caused his imprisonment at Saint Lazare. He was appointed keeper of medals and antiquities at the Royal Library in 1794; and he also assumed the editorship of the *Magasin Encyclopédique* in 1795, which publication became the *Annales Encyclopédiques* in 1817. In the issues of these periodicals appeared many highly-learned articles by Millin himself. He was a member of the French Institute and a chevalier of the Legion of Honor. He translated ‹Mélanges de litterature étrangère› (6 vols., 1785–86); and was author of ‹Antiquités nationales› (5 vols., 1790–98); ‹Discours sur l'origine et les progrès de l'histoire naturelle en France› (1790); ‹Description statues du jardin des Tuileries› (1798); ‹Monuments antiques inédits ou nouvellement expliques› (2 vols., 1802–04); ‹Nouveau dictionnaire des beaux arts› (3 vols., 1806); ‹Histoire métallique de la Révolution française› (1806); ‹Voyages dans les départments du midi de la France› (5 vols., 1807–11); ‹Peintures des vases antiques› (2 vols., 1808–10); ‹Galerie mythologique› (2 vols., 1811); ‹Voyage en Savoie, en Piémont, á Nice et á Genève› (2 vols., 1816); ‹Voyage dans le Milanais› (1817), etc.

MILLINOCKET, Me., village in Penobscot County, 83 miles by rail north of Bangor, on the Bangor and Aroostock Railroad and in the Maine lake region. There are paper mills and a limited lumber trade. Pop. 3,368.

MILLIPEDE, or **MILLEPED** («thousand-legs»), common name for a myriapod of the sub-order *Chilognatha* or *Diploda,* so called from its many feet. The body is hard and cylindrically shaped, with many segments, most of which have two pairs of feet. They are found in water or damp places and are harmless, differing in this respect from some of the centipedes. See CENTIPEDE; MYRIAPODA.

MILLIS, John, American army engineer: b. Wheatland, Mich., 31 Dec. 1858. He was graduated at the United States Military Academy in 1881. He was in charge of the improvements in the New Orleans Harbor and the Mississippi levees in 1890–94; and was chief engineer of the United States Lighthouse Board, Washington, D. C., in 1894–98. He was on duty with the Engineers' Battalion at Willets Point, N. Y., and in Cuba in 1898–1900, reaching rank as major in 1900. He had charge of the construction of harbor fortifications on Puget Sound; of river and harbor improvements in Washington, Idaho and Montana; of improvements in Mount Ranier National Park and of surveys and harbor improvements in Alaska in 1900–05; and was in charge of all fortifications construction in the Philippine Islands in 1905–07. While on leave of absence he traveled through China, Burmah, India, Egypt and Europe on his return from the Philippines. He was in charge of river and harbor improvement work on Lake Erie and in Ohio, Indiana, Massachusetts and Rhode Island in 1908–12; and in 1912–16 was on special duty in connection with the lighthouses of the northeast shore. He was promoted colonel in 1910. He was division engineer for the Southeastern Coast Defenses in 1916, and in 1917 was appointed chief engineer of the Southeastern Military Department, Savannah, Ga. Author of ‹Safety of Navigation on Great American Lakes› (1912).

MILLOM, England, market-town in Cumberland, on the Duddon Estuary, nine miles northwest of Barrow and 60 miles north of Liverpool, on the Furness Railway. There is an early Norman church and the dismantled castle of Millom, built in the 11th century and fortified in the 14th century. The park of the castle was turned into farm lands early in the 19th century. The largest known deposits of red hematite in the country are located here, and a seawall and embankment have been built for the mine's protection as part of it lies under the Duddon Estuary. There are smelters in the neighborhood and the town owns its water and gasworks and has a technical school. Pop. 8,612.

MILLS, Albert Leopold, American army officer: b. New York City, 7 May 1854; d. 8 Sept. 1916. He was graduated from West Point in 1879 and was commissioned in the cavalry. He served in several campaigns against the Indians and in 1894–98 was instructor in the United States Military School at Fort Leavenworth, Kan. Upon the opening of the war with Spain he was ordered to the front, where he rendered distinguished service at the battles of Las Guasimas and Santiago and was brevetted major and lieutenant-colonel. From 1898–1906 he was superintendent at West Point, with the rank of colonel and regimental captain. On 28 July 1902 he was awarded the Congressional Medal of Honor for distinguished gallantry in action near Santiago de Cuba, 1 July 1898, for encouraging those about him, though shot through the head and practically sightless. He was commandant of the Department of Visayas (1907–08); of the Department of Luzon (1908–09); of the Department of the Gulf, Atlanta, Ga. (1909–12); president of the Army War College after 1912.

MILLS, Benjamin Fay, American clergyman: b. Rahway, N. J., 4 June 1857; d. 1 May 1916. He was graduated from Lake Forest University, Illinois, in 1879; was ordained to the Congregational ministry in 1878; held pastorates at Rutland, Vt., Albany, N. Y., and other places; and was a prominent evangelist from 1886 to 1897. In 1897 he withdrew from the Congregational denomination, owing to his liberal views, and in 1897–99 conducted independ ent religious meetings in Boston. In October 1899 to October 1903 he was pastor of the First Unitarian Church of Oakland, Cal. From November 1903 to June 1915 he delivered courses of lectures on philosophy, psychology and sociology in leading cities throughout the United States. In June 1915 he returned to the evangelical ministry, was received as a member of the Presbytery of Chicago and resumed his former evangelistic work. Among his books are ‹Power from on High› (1899); ‹Victory Thru Surrender› (1892); ‹God's World› (1893); ‹The Divine Adventure› (1904).

MILLS, Clark, American sculptor: b. Onondaga County, N. Y., 1 Dec. 1815; d. Washington, D. C., 12 Jan. 1883. He went South, learned the millwright's trade, worked at New Orleans and later at Charleston, where he was employed by a plasterer, and discovered a method for taking a cast from the living face which enabled him to make plaster busts cheaply. In 1845 he completed a bust in marble of Calhoun, which was placed in the Charleston city hall in 1846. In 1848 he was appointed by the government to execute an equestrian statue of Andrew Jackson. This was the first large statue cast in metal in the United States. Mills was obliged to learn casting, since there was then no foundry in the country adequate to the work, and when the statue was at last completed it was at a loss to himself of $7,000. This was later repaid to him by Congress in an appropriation of $20,000 for a replica at New Orleans. His colossal equestrian statue of Washington, depicting the general at the battle of Princeton, was unveiled at Washington on 22 Feb. 1860. He also cast from designs by Thomas Crawford (q.v.) the statue of «Freedom» which was placed surmounting the dome of the capitol in 1863, and took a life-mask of President Lincoln shortly before the latter's death.

MILLS, Darius Ogden, American banker and capitalist: b. North Salem, Westchester County, N. Y., 5 Sept. 1825; d. 3 Jan. 1910. He was educated in the North Salem Academy and the Mount Pleasant Academy, Sing Sing, N. Y. He became cashier of the Merchants' Bank of Erie County, Buffalo, N. Y. In 1849 he went to California where he founded the banking-house of D. O. Mills and Company; from 1864–67 was president of the Bank of California, San Francisco, and after the failure of that institution he again took charge of it until 1878. After 1880 he was largely interested in New York real estate; also prominent in philanthropic enterprises, the Mills hotels being the most noted examples of his generosity.

MILLS, David, Canadian jurist: b. Oxford, Ontario, 18 March 1831; d. 8 May 1903. He was educated at the University of Michigan and entered early upon a public life. He served in the Dominion House of Commons in the Liberal interest 1867–96 and was editor of the *Canada Daily Advertiser*, London, Ontario, 1882–87. In 1876–78 he was Minister of the Interior, was elevated to the Senate in 1896, was Minister of Justice 1897–1902, and in 1902 was appointed a puisne judge of the Supreme Court of Canada. He was an authority on constitutional and international law and was the author of a ‹Report on the Boundaries of the Province of Ontario› (1873); ‹Canadian View of the Alaskan Boundary Dispute› (1899); and ‹The English in Africa› (1900).

MILLS, Hiram Francis, American engineer: b. Bangor, Me., 1 Nov. 1836. After graduation from the Rensselaer Polytechnic Institute in 1856 he was engaged in engineering work for the Bergen, N. J., tunnel of the Erie Railroad (1858); for the Brooklyn waterworks (1859); and for those at Cohoes, N. Y., and Lowell, Mass. He was also engaged in engineering work on the Hoosac Tunnel, Fitchburg Railroad, Mass. Mr. Mills' chief distinction is in connection with the control and distribution of water. He was instrumental in planning the control of water power on the Merrimac River at Lawrence and Lowell; was chief engineer of the Essex Company at Lawrence in 1894; consulting engineer of the Boston Metropolitan Water and Sewerage Board; and from 1896 to 1914 engineer member of the Massachusetts Board of Health and chairman of its committee on water supply and sewerage. He also directed the Lawrence Experiment Station investigation of water and sewerage purification. In 1878–93 he designed and built the slow-sand filters of the waterworks of Lawrence, Mass., which began a new era in the purification of water. He was consulting engineer for important works in many cities of the United States and Mexico, and published numerous papers and essays on engineering subjects. Harvard gave him the degree of M.A. in 1889.

MILLS, James, Canadian agriculturist and educator: b. near Bond Head, Ontario, 1840. He was graduated at Victoria University in 1868. After teaching for many years he became president of the Ontario Agricultural College at Guelph in 1879. As president and organizer of farmers' institutes for 25 years, he greatly promoted agriculture in Ontario. In 1899 he was a member of the San José Scale Commission. In 1904 he was appointed a member of the Board of Railway Commissioners for Canada. From 1890 to 1910 he served on the board of regents for the Victoria University and he also became senator of the Toronto University. With Thomas Shaw he published ‹First Principles of Agriculture› (1890).

MILLS, Lawrence Heyworth, American philologist: b. New York, 1837. He was graduated at New York University in 1857, and at Fairfax Episcopal Theological Seminary, Virginia; and entered the Episcopal ministry in 1861. He was stationed in Brooklyn for six years; retired from the ministry in 1867; studied Gnosticism and the Avesta in Europe 1872–87; and in the last-named year, having established his reputation as an authority on the Zend-Avesta, went on Max Müller's invitation to Oxford, where he became professor of Zend philology in 1898. He contributed largely to Oriental journals various papers on the Gâthâs and early Zoroasterianism; translated ‹Zend-Avesta› (Part III in ‹Sacred Books of the East,› 1887); and wrote ‹Study of the Five Zarathushtrian Gâthâs› (1894); ‹Gâthâs of Zarathushtra in Metre and Rhythm› (1900); ‹Dictionary of the Gâthic Language of the Zend-Avesta› (1902–14); and ‹Zoroaster, Philo, the Achæmenids and Israel› (1903–06); ‹Avesta Eschatology Compared with the Books of Daniel and Revelations' (1908); 'Yasna I,' with Avesta, Sanskrit, Pahlavi and Persian texts (1910); 'Our Own Religion in Ancient Persia' (1913); 'Lore of Avesta in Catechetical Dialogues' (1914). 'The Creed of Zarathushtra' (1916); 'The Vital Necessity of the Persian Theology to all Biblical Study' (1916).

MILLS, Robert, American architect and engineer: b. Charleston, S. C., 1781; d. Washington, D. C., March 1855. He was a pupil of the architect Benjamin Latrobe (q.v.), and beside designing important structures in Philadelphia, including the single-arch bridge across the Schuylkill, erected custom-houses and marine hospitals in various parts of the United States and the Washington Monument in Baltimore. In 1837 he was appointed architect of the general government at Washington, where he built the Treasury, General Post Office and Patent Office and designed the Washington Monument. He published 'Statistics of South Carolina' (1826); 'American Pharos, or Lighthouse Guide' (1832), etc.

MILLS, Roger Quarles, American lawyer and politician: b. Todd County, Ky., 30 March 1832; d. 1911. He moved to Texas in 1849 and studied law; was admitted to the bar at 20, the Texan legislature removing the disability of minority; and began practice at Corsicana. In 1859 he was elected to the Texas legislature. On the outbreak of the Civil War he joined the Confederate service and fought throughout the war. In 1872 he was elected to Congress as a Democrat, serving till 1892; he was chairman of the House Committee on Ways and Means, and drafted the Mills Tariff Bill, which, however, failed to become a law. In 1892 he was elected to the Senate to fill an unexpired term and in 1893 was re-elected for the full term of six years.

MILLS, Samuel John, American Congregationalist clergyman: b. Torringford, Conn., 21 April 1783; d. at sea, 16 June 1818. He was graduated from Williams College in 1809, where he had as an undergraduate organized the first society of foreign missionaries in America, and he afterward studied at Yale and at Andover Seminary. In 1810 he founded the American Board of Commissioners for Foreign Missions. He was licensed to preach in 1812 and at once went on a missionary tour through the Southern States and made a second tour in 1814, succeeding in organizing various religious societies. He was ordained to the ministry in 1815 and in 1817 was sent to Africa to select a site for a colony. He died on the way home.

MILLS, Thomas Wesley, Canadian physiologist and educator: b. Brockville, Ontario, 1847; d. 1915. He was educated at Toronto University and studied medicine at McGill University, Montreal, afterward completing his course in Germany and England. In 1910 he became professor emeritus of physiology at McGill after having taught there from 1882. He was one of the founders of the Society for the Study of Comparative Physiology in 1885. His publications include 'Text Book of Animal Physiology' (1889); 'Text Book of Comparative Physiology' (1890); 'How to Keep a Dog in the City' (1891); 'The Dog in Health and Disease' (1892); 'Nature and Development of Animal Intelligence' (1898); and 'Voice Production in Singing and Speaking on Scientific Principles' (1906).

MILLS BILL. See TARIFF.

MILLS COLLEGE, at Mills College (P.O.) in Alameda County, Cal., was founded in 1871 as Mills Seminary for Young Women. It was chartered as a college in 1885 and the preparatory department was discontinued in 1911. The A.B. and B.S. degrees are granted. Beside the so-called standard departments, four-year courses in home economics and physical training are offered leading to the B.S. degree and a teacher's certificate. In 1915 there were 30 instructors and 153 students. The property was valued at over $400,000.

MILLSAPS COLLEGE, in Jackson, Miss., founded in 1892 by the Methodist Episcopal Church, South. The courses of study lead to the degrees of A.B., B.S. and Ph.B. In 1916 there were connected with the school 22 professors and instructors and 250 students.

MILLSPAUGH, Charles Frederick, American botanist: b. Ithaca, N. Y., 20 June 1854; d. Chicago, Ill., 15 Sept. 1923. He studied at Cornell; was graduated from the New York Homœopathic Medical College in 1881; practised medicine for 10 years and became botanist of West Virginia University in 1891; professor of medical botany in the Chicago Homœopathic Medical College in 1897; and was curator of the department of botany in the Field Museum of Natural History after 1894. He traveled in Mexico, in Brazil, in the West Indies, Japan, China, Straits Settlements, Java, Burma, Philippines, India, Ceylon and Europe. He was a member of the Explorers' Club and various scientific societies, as well as of the Mexican and Brazilian Faculties of Medicine. His published works are 'American Medical Plants' (1887); 'Flora of Saint Croix, D. W. I.' (1902); 'Plantæ Yucatanæ' (1903); 'Contributions to North American Euphorbiaceæ' (1898); 'Plantæ Insulæ Ananasensis' (1900); 'Plantæ Utowanæ' (1900); 'Contributions to the Flora of Yucatan I, II, III' (1895–98); 'Prænunciæ Bahamenses' (1906); 'Flora of the Sand Keys of Florida' (1907); 'One Thousand American Fungi' by MacIlvaine, revised and supplemented edition (1912).

MILLSPAUGH, Frank Rosebrook, American Protestant Episcopal bishop: b. Nichols, N. Y.; d. November 1916. He was graduated from the Shattuck School, Fairbault, Minn., in 1870, and from the Seabury Divinity School there in 1873. He entered the Episcopal ministry in the year last named, served as missionary in Minnesota 1873–76, was subsequently dean of the Omaha (Neb.) Cathedral, rector of Saint Paul's, Minneapolis, and dean of Topeka (Kan.) Cathedral. In 1895 he was consecrated bishop of Kansas.

MILLSTONE, one of the two cylindrical stones used to grind grain into flour (q.v.). The best foreign stones are the German basaltic lava quarried near Cologne, and the French burstone; both are imported into the United States in small pieces from which the cylindrical stone is built up. The native stone is commonly used in the single piece; a sandstone found in Ulster County, N. Y., and in Lancaster County, Pa., and a burstone much like the French, are the best materials, being hard and tough and having a cellular structure, which in the burstone is due to the presence of fossil casts. The lower stone is usually fixed; the upper stone is the «runner.» Each stone is deeply scored with furrows, which lead the milled grist away from the centre; the intervals are styled «land»; and the hole in the center is called the «eye.» A depression about the eye is the «bosom.» The scheme for scoring the stone varies greatly. The roller process (described under FLOUR) has relegated the millstone to the minor grist mills. See MINERAL PRODUCTION OF THE UNITED STATES.

MILLSTONE GRIT, a hard siliceous conglomerate with quartz pebbles found at the base of the Pennsylvania coal measures series of the carboniferous system. The formation occurs as far north as New York and as far south as Alabama, practically throughout the Appalachian Range. In Pennsylvania the beds are coarse and over 1,200 feet thick. The rock in Pennsylvania is light in color and is called the Pottsville Conglomerate. It is interstratified with some sandstone, thin beds of carbonaceous shells and thin beds of coal. In the southern portion of the Appalachian Mountains the coal beds are richer and more plentiful. See CARBONIFEROUS.

MILLVALE, Pa., borough, in Allegheny County, on the Allegheny River, opposite Pittsburgh. It is an industrial suburb of Pittsburgh; its chief manufactures are lumber, iron and steel products, saws and dressed stone. Pop. 8,600.

MILLVILLE, mĭl'vĭl, N. J., city in Cumberland County, on the Maurice River, a navigable stream 20 miles in length, which empties into the Delaware Bay, and on the West Jersey and Sea Shore Railroad, a branch of the Pennsylvania Railroad, situated just 40 miles south of Philadelphia and 40 miles north of Cape May, N. J. In 1801 Millville was incorporated as a town and in 1866 received its city charter. It is entirely a manufacturing city, and the largest industrial centre in South Jersey. Its chief industrial establishments are foundries, glass factories, dye works, bleacheries, cotton mills and machine shops. Sand mining is also a very important industry in this community. It has a large up-to-date high school, eight grammar schools and one parochial school, 10 large and beautiful church buildings, consisting of all denominations, a large park, situated on the shores of Union Lake, a body of fresh water three miles long and almost a mile wide, and numberless fine private residences, paved streets and sidewalks. The city proper covers a radius of five square miles, and is one of the best electric lighted cities in the East, having installed the very latest and most up-to-date type of street lights. The best State roads in the State lead through the city, which can be approached from any direction and there is also a new and high-grade Municipal Hospital, erected in 1913, at a cost of $35,000. The government is administered under the new city charter of 1913, which provides commission form of government by the election of five commissioners who hold office for a period of four years, and who have charge of various departments of the city's business. The president of this commission is one of the five commissioners, who is elected as such, and termed mayor by his colleagues. Pop. (1920) 14,691.

MILMAN, Henry Hart, English historian and poet: b. London, 10 Feb. 1791; d. near Ascot, 24 Sept. 1868. He was graduated from Brasenose College, Oxford, in 1814, became a Fellow of the college in that year, took orders in 1816, was appointed incumbent of Saint Mary's, Reading, in 1818, and was professor of poetry at Oxford 1821–31. In 1835 he became rector of Saint Margaret's, Westminster, and in 1849 dean of Saint Paul's. His best-known works are his ‘Fazio,’ a poetical drama (1815), first presented at London in 1818 with great success; ‘History of the Jews’ (1830), in which he showed himself a pioneer in the application of criticism to the records of the chosen people; and his ‘Latin Christianity’ (1855), an excellent general survey written with admirable candor and breadth. Among his other publications are ‘The Fall of Jerusalem’ (1820), a dramatic poem; ‘History of Christianity under the Empire’ (1840). He is the author of such well-known hymns as ‘When Our Heads are Bowed with Woe’ and ‘Brother, Thou art gone before us.’ Consult Milman, A., ‘Henry Hart Milman’ (1900).

MILMORE, Martin, American sculptor: b. Sligo, Ireland, 14 Sept. 1844; d. Roxbury Highlands, Boston, Mass., 21 July 1883. He studied at Boston with Thomas Ball and established there his own studio. In 1863 he executed for the Sanitary Fair the statuette ‘Devotion,’ later studied for a time in Rome, where he made busts of Pius IX, Charles Sumner, Wendell Phillips, Emerson and others of eminence and designed the soldiers and sailors' monument on Boston Common, for which he had been commissioned by the city. This monument, generally regarded as his greatest work, was dedicated in 1877. He executed also the soldiers' monument at Charlestown, Mass., a mediocre composition ‘America’ at Fitchburg, Mass., and the ‘Weeping Lion’ at Colby University, Waterville, Me. His bust of Sumner is in the Metropolitan Museum, New York; that of Ticknor in the Boston Public Library; and a bronze copy of that of Phillips is also in the Boston Library, to which it was presented by the Phillips Memorial Association in 1900. One of his best-known works is the huge granite Sphinx in Mount Auburn Cemetery, Cambridge, Mass.

MILNE, John, English geologist and seismologist: b. Liverpool, 1850; d. Isle of Wight, 30 July 1913. He was educated at King's College and the Royal School of Mines, London, and practised as mining engineer in Cornwall, Lancashire, central Europe and Newfoundland, besides accompanying an expedition to Arabia as geologist. In 1875 he was appointed by the Japanese government to the chair of geology and mining in the Imperial College of Engineering at Tokio, where he married a Japanese lady and remained nearly 20 years. In 1880 he founded the Seismological Society of Japan, from which hundreds of observing stations sprang up all over the country — a land subject to perhaps a thousand earthquake shocks a year. With the assistance of English colleagues Milne was the first to devise instruments for recording these shocks, and his investigations led to the precision now obtaining in the science of seismology. Shortly before leaving Japan his residence was destroyed by fire; all his books, instruments and 2000 volumes of the 'Transactions of the Seismological Society of Japan' were lost. Returning to England in 1895 Milne and his wife settled in the Isle of Wight, where he erected the world-renowned seismological observatory and equipped it with instruments that record shocks in any part of the globe. This annual analyses of the records thus obtained approximately determined the positions of 57 earthquakes per year. The Milne seismograph is the standard instrument in use to-day. He compiled a 'Catalogue of Destructive Earthquakes, A.D. 7 to A.D. 1899' (1912) for the British Association, showing 4,151 entries. His two volumes on 'Seismology' and 'Earthquakes' are standard textbooks. Milne was the recipient of numerous decorations and honors from different countries.

MILNE-EDWARDS, Henri, French naturalist: b. Bruges, Belgium, 23 Oct. 1800; d. Paris, 28 July 1885. His parents were English. He studied medicine in Paris, taking his degree in 1823. Soon he turned his attention to zoology. After teaching for several years in the Collège de Henri IV, he was elected in 1838 a member of the Académie de Sciences in Cuvier's place. His 'Recherches anatomiques sur les crustacés,' published in 1828, attracted attention, and from that time until his death he published books and essays on his specialty; taught natural history, and became a noted educator, as well as an original investigator. In 1837 he became editor of the zoological department of the 'Annales des sciences naturelles,' which he held for 50 years and to which he was a contributor. In 1841 he became professor of entomology in the Jardin des Plantes (Museum of Natural History), Paris, where 21 years later he succeeded Geoffrey St. Hilaire in the chair of zoology. In 1864 he became director of that famous institution. The Royal Society of England honored him in 1850 with the Copley medal for his zoological work. Milne-Edwards was the first to describe the important biological principle of the physiological division of labor. Although a contemporary of Darwin and Huxley, Milne-Edwards was little influenced by those men of science and held to the doctrine of special creations instead of the evolution theory. In the work of his latest years he was assisted by his son, Alphonse (1835–1900), who was a specialist in the study of fossil birds and deep-sea exploration. Milne-Edwards published 'Éléments de zoölogie ou leçons sur l'anatomie, la physiologie, la classification, etc., des animaux' (1834–35), which had an enormous circulation, and was much used as a basis for manuals of zoology; a revision of Lamarck's 'L'histoire naturelle des animaux sans vertèbres' (1836–45), and with Dehayes 'Leçons sur la physiologie et l'anatomie comparées de l'homme et des animaux' (1855–84); 'Histoire naturelle des crustaces' (1834–40) and 'Histoire naturelle des corallinaires' (1857–60) were noteworthy. His 'Lectures on the Physiology and Comparative Anatomy of Man and the Animals' (14 vols., 1857–81) are valued for their great fund of information and ample references. He also published 'Natural History of the French Coasts' (1832–45) and 'Natural History of the Mammalia' (1871). His elder brother, WILLIAM FREDERICK (Jamaica 1776–Versailles 1842) was almost as celebrated. He founded the Ethnological Society in Paris and is considered as the father of ethnology in France.

MILNER, SIR Alfred, VISCOUNT MILNER, English administrator: b. Bonn, Germany, 23 March 1854. He studied in Germany, where his father had been instructor in English at the University of Tübingen, then at King's College, London, and at Balliol, Oxford; was Fellow of New College, Oxford; was called to the bar in 1881, and after several years in journalism, part of the time on the *Pall Mall Gazette,* became private secretary to Mr. Goschen, Chancellor of the Exchequer, in 1887. From 1889 to 1892 he was Under-Secretary of State for Finance in Egypt; in 1892 became chairman of the Board of Inland Revenue, and in 1897 was appointed to the double post of high commissioner for South Africa and governor of Cape Colony. In 1900 he became administrator of the Transvaal and Orange River colonies, of which he was made governor in 1901. He took a prominent part in all negotiations with the Boers before, during and after the war, and his conduct throughout was the subject of much controversy in Great Britain. After the passing of a resolution in the House of Commons directed against his policy on Chinese labor he resigned in December 1905. He has taken a prominent part in advocating the causes of imperial federation, tariff reform and compulsory national service. In December 1916 he became a member of the Inner War Cabinet in Lloyd George's National Ministry. He is a man of high culture and is the author of 'England in Egypt' (1892), and 'The Nation and the Empire: Speeches and Addresses' (1913). He was created G. C. B. baron in 1901 and viscount in 1902. Consult Worsfold, 'Lord Milner's Work in South Africa' (1906) and 'Reconstruction under Lord Milner' (1913).

MILNER, John, Roman Catholic bishop and archæologist: b. London, England, 1752; d. Wolverhampton, England, 1826. He was ordained priest in 1777. In 1779 he settled in Winchester, the architecture and historical associations of which appealed to him strongly. In 1803 he became titular bishop of Castabala, Cappadocia. In 1804 he settled in Wolverhampton, having been made apostolic vicar of the Midland district in England. He took conspicuous part in the controversy regarding the removal of the right of vote on appointment of Roman Catholic bishops as part of Peel's Catholic Relief Act (passed in 1829). His courageous action in this fight gained him the sobriquet of «the English Athanasius.» He was the author of 'Antiquities of Winchester' (2 vols., 1798–1801; 3d ed., 1839); 'Treatise on the Ecclesiastical Architecture of England during the Middle Ages' (1811; 3d ed., 1835), and 'The End of Religious Controversy' (1818). Consult Husenbeth, F. C., 'Life of John Milner' (Dublin 1862), and Ward, 'Dawn of the Catholic Revival in England, 1781–1803' (2 vols., Dublin 1909).

MILNER, Joseph, English ecclesiastical historian: b. Leeds, England, 1744; d. 15 Nov. 1797. He was educated at Leeds Grammar School and at Cambridge and became well known as headmaster of Hull Grammar School.

In 1768 he was lecturer at Holy Trinity Church, Hull, and greatly advanced the success of the Evangelical movement, both there and as vicar of North Ferriby, near Hull. He published essays and sermons, but his chief work is the ‹History of the Church of Christ,› of which he lived to complete three volumes, ending with the 13th century. The fourth volume (to the 16th century) was edited from manuscripts by his younger brother, Dr. Isaac Milner, dean of Carlisle Cathedral, who also published a complete edition of the works of Joseph Milner (8 vols., 1810). The principles on which Milner based his ‹History› are of the narrowest kind and he shows little critical insight.

MILNES, Richard Monckton, See Houghton, Richard Monckton Milnes.

MILO, mī'lō, ancient Greek athlete. He was a native of Crotona, in Magna Græcia, Italy, and celebrated for his great strength. He bore off the prize six times in the Olympic games, and on an equal number of occasions at the Pythian. He was appointed to command an army against the Sybarites, and at the battle at the Crathis, 511 B.C., his great strength is said by Diodorus to have given the victory to the Crotonians. Many anecdotes are related of him. He once carried a heifer of four years to the sacrifice on his shoulders, killed it with a blow of his fist, and afterward, it is added, ate the whole of it on one day. His death is characteristically related. When enfeebled by age he attempted to rend open the trunk of a tree partially split by wood-cutters, but the wood, closing on his hands, held him fast and he was attacked and devoured by wolves.

MILO, Titus Annius, Roman tribune and political leader: b. Lanuvium in early part 1st century B.C.; d. district of Thurii, 48 B.C. In 57 B.C., when tribune of the plebs, his quarrel with Publius Clodius began. Seeking preferment in the state, he became the ally of Cneius Pompey, urging the recall of Cicero from exile, whither he had been sent at the instance of Clodius, as a pretext for their acts. Bands of gladiators in the emplov of Milo and of Clodius kept Rome in constant terror by their skirmishes. Finally, in a clash at Bovillæ, on the Appian Way, Clodius was murdered 20 Jan. 52 B.C. Milo was impeached for acts of violence in occupying public places and going about under arms, and for bribery in his canvass for the consulship. His trial began 4 April 52 B.C. Cicero undertook his defense, but the hostility of the Clodius faction was so marked that his speech was not delivered. In a revised and enlarged form it was sent by Cicero to Milo at Massilia (Marseilles), whither he had gone into exile upon his condemnation under the first count. In 48 Milo returned to Italy and joined Marcus Caelius in rebellion against Cæsar.

MILO, or MILOS. See Melos.

MILOSH, prince of Serbia. See Serbia; Obrenovitch.

MILOUNA (mĭ-loo'nä) **PASS,** Greece, a frontier-pass of the Olympian Mountains in Thessaly, a few miles north of Tyrnavos. On 18 April 1897 it was the scene of a fierce battle between the Turks and Greeks during the Græco-Turkish War of that year. About 50,000 men were engaged on both sides, and the Greeks were defeated with heavy loss.

MILREIS, mĭl'rĕs, or **MILREI,** a Portuguese coin and the unit of account in Portugal. A thousand reis is one milrei, equal to $1.08. In enumeration the figure $ is used to denote the thousandth place, thus one milrei is written 1$000. The colon marks the place of contes (1,000,000 reis), the period the place of thousands of millions. The milreis is also the monetary unit of Brazil and is valued at 54.61 cents (United States).

MILROY, Robert Huston, American soldier: b. Washington County, Ind., 11 June 1816; d. 1890. He was graduated from Norwich University, Vermont, in 1843 and served in the Mexican War, after which he studied law and was admitted to the bar in 1849. In 1851 he was appointed justice of the Eighth Judicial Circuit Court of Indiana. When the Civil War broke out he organized a company of volunteers and was mustered into service as colonel, later receiving the rank of brigadier-general, and in 1862 was made major-general. In 1863 he was engaged in battle with a superior force under General Lee, and after a gallant fight of three days' duration was compelled to retreat. An investigation of his conduct followed, which resulted favorably for Milroy, who, however, resigned in 1865. He was trustee of the Wabash and Erie Railroad in 1868, in 1868–74 was superintendent of Indian matters in Washington Territory and in 1874–85 Indian agent.

MILTIADES, mĭl-tī'ạ-dēz, Athenian general: d. 489 B.C. He was a descendant of the Philaïdes and, after being archon at Athens in 524, inherited a minor principality in the Chersonesus in 518. He governed well there; accompanied Darius against the Scythians in 515, and being left at the bridge across the Danube urged its destruction in order that Greece might thus be rid of a possible Persian enemy. This plan was vetoed by Histiæus, another Greek tyrant. In 493 he left his kingdom for fear of the Persians, and upon their invasion of Greece in 490 became one of the 10 generals of the Athenian army. Each of the other generals retired in Miltiades' favor, but he refused to lead the army until his own day of command came. Then he won the great battle of Marathon, routing the Persian land forces. The victorious general in the next year asked the state of Athens for a fleet of 70 ships, got his request, but did not explain that he wished to punish the people of Paros from motives of private revenge, and, when his expedition failed and its purpose became known, he was impeached, fined 50 talents and imprisoned for lack of ability to pay. He died in prison of a wound received at Paros.

MILTIADES, Saint, also called **MELCHIADES,** Pope or bishop of Rome from 2 July 310 to 10 or 11 Jan. 314. He is best known as having sat as presiding officer at a synod held at Rome in 313, by desire of the Emperor Constantine, to hear a petition from the Traditones or Catholics in North Africa who had, on demand of the Emperor Diocletian, given up their sacred books and thus, in the opinion of those who resisted the demand, forfeited the rights and privileges of Church membership. The action of the Traditones split the Church into two bitter factions, a condition that was not suppressed until several synods and other courts, of which the Roman synod was one, had effectually quelched the movement by denying the pleas of the Traditones on every occasion. Nothing is known of the early history of Miltiades, except that he was born in Africa, and the date of his death is uncertain.

MILTITZ, Karl Von, German ecclesiastic: b. about 1490; d. about 1529. He was the son of a nobleman of Saxony, entered upon a clerical career as priest, and was subsequently canon of Mainz, Treves and Meissen. By favor of Pope Leo X, after appointment as a papal notary in 1515, he was chosen by that pontiff to confer with Luther, then very troublesome to the Church authorities, also with Frederick the Wise, of Saxony, Luther's protector. The sale of indulgences had been condemned by Luther, and Miltitz was dispatched to the scene of Luther's activity with a view to pacification. The whole subject was earnestly discussed, and as an outcome of the conference Luther promised to submit and possibly recant his heretical opinions. Later meetings between the Saxon priest and Miltitz took place at Altenberg, Liebenwerda and Nichtenberg, but the triumph of the Pope's envoy was annulled by the receipt of a papal bull of denunciation before the conference came to an ending. Miltitz was subsequently sent to discipline Tetzel, the priest who had aroused Luther's ire, and denounced him as being both indiscreet and unclerical. Miltitz died, it is supposed by drowning, when on his way back to the Vatican. Consult the biography by Creutzberg (Freiberg 1907).

MILTON, John, English poet: b. London, 9 Dec. 1608; d. London, 8 Nov. 1674. He was the son of John Milton (d. 1647), a prosperous and cultivated scrivener with marked leanings to Puritanism, and Sarah Jeffrey (d. 1637), of whom little is known. The pair had six children, three of whom came to maturity. The eldest of these was Anne, mother of the infant girl upon whom Milton wrote his elegy, ‹O fairest flower, no sooner blown than blasted›; of Edward Phillips, author of ‹Theatrum Poetarum,› and of the hack-writer, John Phillips, both of whom Milton taught. She married for her second husband, Thomas Agar. John, the poet, was the second of the Milton's surviving children. The youngest was Christopher (1615–93), who became a loyalist and a Roman Catholic, and was knighted and made a judge by James II.

Milton was born in Bread street, Cheapside, at the sign of the Spread Eagle, where his father conducted his business. The elder Milton was a talented organist and composer, who is said to have taught his son to play the organ and to have made his house the resort of the best musicians of the day. John was beautiful in childhood and soon showed literary and scholarly proclivities. He was at first taught at home by Thomas Young, afterward a noted Puritan clergyman, to whom he addressed his fourth Latin elegy. Then he attended Saint Paul's School under the two Alexander Gills, profiting from the classical acquirements of the elder. Here he formed the most memorable of his friendships, that with Charles Diodati, the son of an Italian Protestant who had settled in London as a physician. He spent between four and five years at this school, straining his eyes with study, learning five languages and reading much poetry, especially that of Spenser, whom he later acknowledged as a master, and Joshua Sylvester's (q.v.) uncouth translation of DuBartas, which had a slightly deleterious influence upon his own early poetical compositions. Metrical paraphrases of Psalms cxiv and cxxxvi, preserved by Milton, furnish specimens of his juvenile accomplishments.

On 9 April 1625 he matriculated as a pensioner of Christ's College, Cambridge, his tutor being William Chappell, a religious controversialist, afterward bishop of Cork. With this tutor Milton had some unexplained trouble, which apparently led to a short rustication and to his transfer to another tutor. The interlineation in the manuscript of Aubrey's sketch of the poet to the effect that Chappell «whipt» his most famous pupil may refer to some sort of personal encounter, or else may represent anti-Puritan gossip.

It is abundantly clear from later references to Cambridge in his writings, that Milton, although he was honored for his character and his scholarship, and was several times selected to represent his college as a public speaker, had no great respect for the university's methods and ideals. His beauty of person and his chaste life gained him the nickname of «the lady» and he seems to have formed no special friendships with such promising undergraduates of other colleges as Thomas Randolph, and Edmund Waller (q.v.), his seniors, or with John Cleveland (q.v.), the satirist, and Henry More, the Platonist, junior members of his own college. This aloofness from his fellows and his apparent inability to find inspiring personalities among his instructors probably increased his absorption in his studies and encouraged him to correspond in Latin with Diodati, then at Oxford, as well as to compose poetry, in both Latin and English, not inconsiderable in quantity and extraordinarily good in quality. ‹On the Morning of Christ's Nativity› (1629) is the crowning performance of this period and, despite some youthful defects of fantastic extravagance, is one of the few really great odes in our literature. Less excellent but still memorable are the lines on Shakespeare (1630), the sonnet ‹On his Having Arrived at the Age of Twenty-Three› and ‹An Epitaph on the Marchioness of Winchester.›

Milton, whose brother Christopher had followed him to Christ's, took his bachelor's degree 26 March 1629 and his master's 3 July 1632. He tells us that the college authorities would have been glad if he could have continued to reside with them — probably as a Fellow. His design had been to take orders in the Church, but the High-Church reaction, which Archbishop Laud was fostering, was obnoxious to him, and he was unwilling to come under the control of that masterful prelate. Theological difficulties and objections to an elaborate ritual do not seem to have weighed greatly with him at this time — certainly not to such a degree as the natural aversion of a proud and liberty-loving spirit to submit to the restraints imposed by an ecclesiastical organization dominated by a zealot. No other profession specially attracting him — though there are hints that he thought of the law — he gave himself up to reading and study, with the hope that he might later compose something the world «would not willingly let die.» As this meant that for several years he must be a charge upon his father, the latter surely deserved the thanks conveyed to him in the Latin poem entitled ‹Ad Patrem,› and he should be considered one of the most farseeing of parents.

From July 1632 to April 1638 Milton lived at his father's semi-suburban residence at Horton, in Buckinghamshire. He visited London to purchase books and to take lessons in mathematics and music; but he doubtless found his chief interest at home in studying the classics and French and Italian literature, and in enjoying the beauties of the country around him. His occupations and ideals seem to be described in the companion poems ‹L'Allegro› and ‹Il Penseroso,› which are generally assigned to the second half of 1632; unless, indeed, these idyllic pieces, contrasting as they do two varieties of temperament and modes of life, represent the perplexed state of his mind when he was choosing between a secular and an ecclesiastical career, and belong to a slightly earlier period. To the Horton epoch we certainly owe three of the most notable of his so-called ‹Minor Poems› — the songs and rhymed speech entitled ‹Arcades,› the masque ‹Comus› and the pastoral elegy ‹Lycidas.› The first named was part of an entertainment given before the Countess-dowager of Derby at Harefield in 1633 or 1634. The music for this was furnished by the composer Henry Lawes (q.v.), a friend of Milton's family, and their copartnership in the slighter performance probably led to their association in providing a masque for the celebration of the entrance of the Earl of Bridgewater upon his duties as president of the council of Wales. ‹Comus,› as the masque has been called without Milton's authorization, was probably performed in the great hall of Ludlow Castle on Michaelmas-night (29 September) 1634. So many of Lawes' friends asked afterward to be allowed to read it that the composer had an edition published anonymously in 1637. From that day to this it has been one of the most admired of English poems, and whatever its defects of construction, it is unsurpassed as an idealistic presentation of the power and charm of personal purity. The year that ‹Comus› was printed saw also the writing of ‹Lycidas,› which has been pronounced by Tennyson to be a «touchstone of poetic taste» and by Dr. Johnson to be a poem which no man could have fancied he read «with pleasure had he not known its author.» This elegy was first published in 1638 in a volume of academic tributes to Edward King, a successful rival of Milton's for a fellowship, who was drowned in the Irish Channel in August 1637. The apparent absence of great personal interest on the part of the poet in his subject, and the decreased toleration of the conventions of pastoral poetry, probably account for much of the adverse criticism ‹Lycidas› has received; but it should be remembered that Milton could have attained the requisite sincerity of utterance by centring his thoughts and emotions upon the loss sustained by the Church in the death of so promising a clergyman, and that such consummate art of versification and diction as ‹Lycidas› displays and such a felicitous adaptation of a time-honored form of poetry to comparatively modern uses should render a poem, which a series of competent judges has pronounced a masterpiece, unamenable to the censure of the catholic reader. On the other hand, it may be remarked that it seems somewhat uncritical to rank, as is often done, these poems of the young poet of Horton, admirable but still not magnificent in scope, above the sublime masterpieces which gave Milton his place among the supreme poets of the world. It is scarcely conceivable that if Milton had died immediately after writing ‹Lycidas› his name would now be widely known outside the English-speaking nations.

In 1638, after his mother's death, Milton, through his father's generosity, was enabled to take a foreign tour in a style befitting a gentleman. At Paris he met Grotius (q.v.), but he did not like the city and passed soon into Italy, going by sea from Nice to Leghorn. He spent about a year on the peninsula, two visits of some two months each being given to Florence, where he made friends among men of culture, and impressed them by his accomplishments both in the classics and in Italian. In Rome his outspoken Protestantism almost got him into trouble. At Naples he formed an acquaintance with the aged Marquis Manso, the protector of Tasso and Marini, to whom he addressed some Latin verses important as showing that he was planning an epic upon King Arthur. Here he abandoned his intention of visiting Sicily and Greece, since the political news from England was too disturbing to allow a patriot to wander far from home. He made a leisurely return, was in Geneva early in July 1639, where he probably heard of the death of Diodati, and landed in England toward the end of the month.

The literary memorials of the tour consist of a few fluent Italian sonnets and a canzone (which afford shadowy evidence of a love affair with a young lady of Bologna), and some Latin verses, including three epigrams inspired by the singer, Leonora Baroni. Milton does not seem to have profited greatly from what he saw of the treasures of plastic art, but his contact with historic places and with the natural beauties of Italy and his association with great men, of whom Galileo, whom he met at Florence, is the most illustrious, must have broadened and deepened his capacities of thought and feeling. With the close of his journey and the composition of what is practically his last, and plainly his best, Latin poem, the touching pastoral elegy on Charles Diodati, entitled ‹Epitaphium Damonis,› Milton's first period ends. The comely, accomplished young man, who blends the grace of the Cavalier with the serious purpose of the Puritan, gives place to the strenuous controversialist, the zealous reformer in church and state, the idealistic partisan. The poet is not entirely swallowed up in the prose man, but he is nearly submerged.

On his return to England Milton took lodgings in Saint Bride's Churchyard and began to tutor the two children of his sister by her first marriage, Edward and John Phillips. Then he moved to a house in Aldergate street, where his nephews boarded with him. Here he lived the life of an abstemious student and developed and practised the stimulating, though rather visionary, educational theories later outlined in

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his letter to Hartlib (June 1644). In 1643 he received a few more pupils, and he continued to play the part of schoolmaster until the autumn of 1647, when his father's death apparently left him in fairly comfortable circumstances.

Meanwhile he had been giving earnest of his literary and scholarly ambitions and of his interest in public affairs, which were rapidly approaching chaos. He planned to write some poem on a noble scale, whether a tragedy or an epic, and he made a list of nearly a hundred possible subjects, chosen from sacred and early English history. At the head of this were four entries which show that the theme of ‹Paradise Lost,› to be treated in the form of a Greek tragedy, was then uppermost in his mind. There were also two entries dealing with the story of Samson, one of which later bore fruit in ‹Samson Agonistes.› But the times were not propitious to poetical composition, and for nearly 20 years Milton wrote only occasional sonnets and scraps of verse, besides some rather astonishingly doggerel versions of Psalms. In 1645, however, he collected his somewhat scanty tale of English and Latin poems into a volume, which was published by Humphrey Moseley, the Tonson or the Moxon of the day. It seems to have made much less impression on readers than the collection of Waller's poems issued the same year. He also worked upon tasks in keeping with his duties as schoolmaster, such as his ‹History of Britain› to the Norman Conquest, not published until 1670, and probably, his ‹Accidence commenc't Grammar› (1669) and ‹Artis Logicæ Plenior Institutio ad P. Remi Methodum concinnata› (1670).

His prose writings practically began in the summer of 1641 with his ‹Of Reformation Touching Church Discipline in England.› Attacks had been made in the Long Parliament upon the episcopal system, and the Bishop of Exeter (later of Norwich) Joseph Hall (q.v.), long since famous as a satirist, had published a defense of his order and a remonstrance to Parliament, which had drawn forth a reply from five Puritan divines under the pen-name «Smectymnuus» formed from their initials. The «t» and the «y» of this uncouth compound were furnished by Milton's former tutor, Thomas Young, who is probably responsible for his pupil throwing himself into the fray. Hall replied to «Smectymnuus» and secured the support of the learned Archbishop Usher (q.v.) and the five Puritans vindicated themselves. Milton's was the sixth pamphlet of the series; and between May 1641 and April 1642 he contributed four others — ‹Prelatical Episcopacy› (June 1641, a reply to Usher); ‹Animadversions upon the Remonstrant's Defense against Smectymnuus› (July 1641, a bitter, point by point answer to Hall's reply to «Smectymnuus»); ‹The Reason of Church-government urged against Prelaty› (about February 1641–42, his most weighty and dignified argument against the episcopal system); and ‹Apology against a Pamphlet called A Modest Confutation of Animadversions upon the Remonstrant against Smectymnuus› (March 1641–42, a reply to the pamphlet, whose title is included in his own title, which was apparently the work of Hall and his son, and was certainly a personal attack, the grossness of which largely extenuated the fierceness of Milton's retort).

Of these five anti-prelatical tracts, none of which is of great length, the first and third have most value in themselves, because they have a broad basis in history, philosophy and theology, and thus afford proofs of Milton's learning and of his powers as an idealistic controversialist. The three others too frequently give unpleasant evidence that Milton was an almost unrivaled master of personal invective. The chief value of the entire series lies in the fact that they contain much nobly conceived and expressed autobiographical information, as well as some of the most sonorously harmonious prose to be found in any literature — for example, the closing paragraphs of the first tract. In general, their cumbrous style, their involved arguments and their antiquated subject matter make them difficult reading to all save professed Miltonians; but when their many merits are duly weighed and the standards of 17th century controversy are borne in mind, it seems scarcely an exaggeration to say that they combine with Milton's other works in prose and verse to give his fame a broader foundation than is possessed by any other English writer.

The pamphleteer and poet appears to have determined deliberately that he could do his country more good by writing on subjects of public concern than by entering the army. It was doubtless a wise decision. This can hardly be said of his resolve to marry. In the spring of 1643 he took a mysterious journey into Oxfordshire — possibly to collect a debt owed him by a cavalier named Richard Powell. A few weeks later he returned to London with this gentleman's 17-year-old daughter, Mary, as his bride. Of the wooing and the reasons for the marriage nothing is known. The bride is said to have remained with Milton a month and then, finding her life dull, to have gone back to her father with the promise that she would return to her husband by the end of September. She failed to keep her promise, and Milton sent a messenger for her, who was unpleasantly treated by her family. Then the irate husband declared he would never receive her and wrote his first tract on divorce. Such is the story given by Edward Phillips. There is an extant copy of the divorce tract, however, which is marked 1 Aug. 1643 — and, unless this is a mistake, we are forced to believe that Milton was pleading for liberty to break the chains of matrimony at a time when, according to precedent, he should have regarded them as strings of roses. Such an idealist might have expressed such views without reference to his own experiences and desires, but it is hard to divest one's self of the belief that in this instance the wish was the father of the theory. It is almost certain that, whether or not there was between the pair a suddenly discovered incompatibility of temperament, each had reason to regret the alliance, Milton because he had too young and flighty a partner, his wife because her Puritan husband, twice as old as herself, was too serious and self-absorbed. In the absence of evidence it is idle to discuss the suggestion that the bride resolved to be one in name only.

In ‹The Doctrine and Discipline of Divorce Restored, to the Good of Both Sexes,› Milton took the advanced stand that «obstinate incompatibility of mind or temper between husband and wife is as lawful a ground for divorce as infidelity.» (Masson). He argued with his usual idealistic fervor and showed plainly that no man could have a higher conception of true marriage than he; but he was singularly blind to the weight of the sociological objections to his theory. His views naturally met with adverse criticism and he expanded them in a second edition under his own name (February 1643–44). In July 1644 he published a less interesting, but far from feeble tract entitled, 'The Judgment of Martin Bucer on Divorce.' Then he was denounced before Parliament, which decreed that a licensing ordinance be prepared and that Milton and his printers be sought for. Nothing further happened, so far as the bold pamphleteer was concerned, save that later he came near being examined by the House of Lords, and that he was given the occasion to write the best-known and most uniformly excellent of his prose works, his eloquent 'Areopagitica, or Speech for the Liberty of Unlicensed Printing' (November 1644). It is needless to say that the Parliament he addressed so boldly with arguments, not absolutely liberal but far in advance of his times, had no opportunity to listen to Milton's own voice, which, however, in a metaphorical sense has since echoed in every legislative hall of every free people. It is probable that he had friends in Parliament who blocked the measures taken to call him to account and that in a less turbulent period he might have paid dearly for his rashness. As it was, he had the dubious honor of having a group of adherents named after him and he published without molestation two more tracts on divorce — 'Tetrachordon, or Expositions upon the four chief places in Scripture which treat of marriage' (March 1644–45), and 'Colasterion: a Reply to a Nameless Answer Against the Doctrine and Discipline of Divorce' (March 1644–45). The temper displayed in the latter pamphlet was not calculated to allay the hostile criticism that assailed him, nor was the rumor that he was courting the attractive daughter of a Dr. Davis particularly to his credit. This rumor and the financial distress of her royalist family seem to have brought Mrs. Milton to terms. She suddenly appeared before her husband while he was visiting at a neighbor's, begged his pardon, and was taken back.

The united couple took a larger house in the Barbican, and the school was somewhat enlarged. Between July 1646 and May 1652 three daughters and a son were born to them, the boy dying in infancy. The mother died not long after the birth of her last child. Meanwhile her father and mother, with some of their children, had been obliged to live with Milton, and money troubles had arisen, scarcely to be wondered at. Another house had also been taken — in High Holborn — and the school had been given up.

During these years Milton seems to have grown as radical in his ecclesiastical and political views as he apparently was in his educational theories and in his domestic economy. He sympathized with the army against the Parliament, with the Independents against the Presbyterians and was one of the first to approve the execution of Charles I. His loosely reasoned 'Tenure of Kings and Magistrates' appeared within two weeks of that event, and was probably the cause of his speedy appointment as Latin Secretary to the Council of State at a salary of about £290 (March 1649–50). His main task was the translation of dispatches intended for foreign governments, but he had also to answer attacks made on the home government, and, ironically enough, to act as a sort of censurer of the press. He was given official apartments in Scotland Yard, was expected to be present at audiences of foreign envoys, in short, held a post of considerable dignity and importance.

The first of his official publications was his 'Observations on the Articles of Peace between Ormonde and the Irish rebels' (May 1649). The second was 'Eikonoklastes,' a point for point answer to the popular 'Eikon Basilike,' supposed to be the last meditations of Charles I, but really, it would seem, the work of John Gauden (q.v.). Milton's answer, which appeared in October 1649, is perhaps the strongest of his controversial pamphlets, but it is now mainly known for its exposure of a plagiarism by Gauden from Sidney's 'Arcadia' and for the over-emphasized evidence it affords of Milton's increasing Puritanism in matters of taste. Another answer to a more important book was the 'Defensio Pro Populo Anglicano,' published in or about March 1650 to counteract the effect produced by the 'Defensio Regia pro Carolo I,' which the learned Salmasius (Claude de Saumaise, professor at Leyden) had written at the instigation of Charles II. Milton's book gave him a Continental reputation, for it was generally felt that he had shown himself to be a match for Salmasius (q.v.) as a writer of Latin, and more than a match as a scurrilous controversialist. Such a reputation was, however, but a slight recompense for the loss of his sight, which was partly due to his persisting to labor on this book as a patriotic task despite the warnings of his physicians. The glaucoma, from which he seems to have suffered, would probably have ended in blindness in any event, but the sublimity of the poet's patriotic self-sacrifice is scarcely lessened by this fact.

Milton's next book was his 'Defensio Secunda' (May 1654), a reply to an invective by Peter Du Moulin which had been edited by a professor in Holland, one Alexander Morus or More, «a Frenchman of Scottish descent.» Milton mistook the editor for the writer and overwhelmed him with abuse, not disdaining to rake up charges of sexual misconduct. Morus naturally but unluckily attempted a reply and was again violently assailed by Milton in his 'Pro Se Defensio' (August 1655). Even the most devoted Miltonian must regret the writing of these gross tracts, although the former does contain interesting passages illustrative of its author's life and political ideals.

Meanwhile Milton at the close of 1651 had removed to a home in Petty France, Westminster. By the middle of 1652 he was wholly blind, but he continued with the help of assistants to do the work of his office at a reduced salary. The most important dispatches, such as those of Cromwell protesting against the persecution of the Vaudois, were still entrusted to him. On 12 Nov. 1656 he married his second wife, Katherine Woodcock, who died 15 months later in childbirth. Milton wrote in her memory a fine sonnet, imitated from an Italian one, but beyond this testimony to her worth little is known of her. We are equally ignorant of the way his house — with a blind father and three small daughters — was conducted during his two periods of widowerhood. He had a small circle of friends, including two of his old pupils, Cyriac Skinner and Henry Lawrence, Lady Ranelagh and Andrew Marvell (q.v.), the last named of whom from 1657 to 1660 assisted him in his duties as secretary. Toward the close of the Protectorate his literary work declined to the writing of a few sonnets and the publication of two or three ecclesiastical and political pamphlets, which are important chiefly as showing that he resisted steadfastly the drift toward monarchy and an established church. It is pathetic to find him at the end of Richard Cromwell's short régime willing to preserve republicanism in name only provided liberty of conscience could be secured. His projects were chimerical and were much ridiculed, the nobility of his idealism making but a slight appeal in such tumultuous times. The dashing of his hopes as a reformer probably led his thoughts back, however, to the channel from which they had been diverted throughout the period of strife. From about 1658 he seems to have meditated an epic poem on the theme of ‹Paradise Lost.› The Stuarts were restored to their kingdom and Milton to his; but, while we may be grateful for this, we need scarcely, with Mark Pattison, view Milton's controversial period as so many lost years. It seems better to agree with Dr. Garnett that ‹Paradise Lost› would not be the poem it is if Milton had not been allowed to develop his powers through his contact with men and affairs.

At the Restoration Milton went into hiding in a friend's house. Two of his books were burned by the hangman, but in some unexplained way, partly no doubt through the influence of Marvell, he was not exempted from the benefits of the Act of Indemnity (29 Aug. 1660). Later he was arrested, but he was soon released and he had influence enough to protest vigorously against being required to pay excessive fees to the sergeant-at-arms of the House of Commons. His immunity from punishment caused much comment, and stories like that of a mock funeral and that of the intervention of Sir William D'Avenant (q.v.) in return for a previous similar intervention by Milton, were probably invented to account for what seemed to be an extraordinary case of leniency or of forgetfulness. When he was out of danger, Milton took a house in Holborn and then in Jewin street. The loss of his salary and of some investments doubtless forced him to lower his scale of living and also prompted him to look out for a third wife who would manage his home better than his eldest daughter did. In February 1662–63 he married Elizabeth Minshull, who seems to have made his last years comfortable in a house in Artillery Walk, Bunhill Fields.

Not long after this last marriage he appears to have finished ‹Paradise Lost› and, with some trouble, to have secured a license for it from Thomas Tomkyns, chaplain to the Archbishop of Canterbury. During the plague of 1665 he retired to Chalfont Saint Giles in Buckinghamshire, and there he loaned his Quaker friend, Thomas Ellwood (q.v.), the complete manuscript of the great epic. Ellwood on returning it made the famous remark which led to the writing of ‹Paradise Regained:› «Thou hast said much here of Paradise Lost, but what hast thou to say of Paradise Found?» It was not until April 1667, partly, perhaps, in consequence of the fire of 1666, that Milton secured a publisher for ‹Paradise Lost.› Then he signed a contract with Samuel Symmons by which the latter was to pay £5 down and £5 more on the sale of each of the first three editions, which were not to exceed 1,500 copies apiece. This is usually referred to as a hard bargain, but in view of Milton's unpopularity, the length and theme of his poem, and his innovation in the use of blank verse, it seems unfair to blame Symmons. It is equally unfair to Milton's contemporaries to maintain that Addison's criticisms in *The Spectator* first showed Englishmen that they possessed an epic poet worthy to rank with Homer and Virgil. Six editions had been published before the close of the 17th century, elaborate annotations had been made upon it and Dryden and Marvell had extolled it. The religious nature of its theme has always, of course, given it a standing somewhat independent of its consummate poetic merits; but these, especially its sublimity and its unrivaled harmonies, have rarely been denied by competent critics of any nationality, and efforts to show Milton's excessive indebtedness to other poets, such as Andreini and Vondel, have not met with great success. That ‹Paradise Lost› is a popular poem or Milton a poet whose genius is ungrudgingly acknowledged by all is not to be maintained; but the supreme and isolated greatness of both seems likely to escape serious challenge. When ‹Paradise Regained› was finished and when ‹Samson Agonistes› was written cannot be accurately determined. They appeared in one volume in 1671, and probably represent Milton's last creative literary labors. It is said that he could not bear to have ‹Paradise Regained› pronounced inferior to ‹Paradise Lost› — a fact, if fact it be, which has been twisted into the statement that he preferred the poem which the public most systematically neglects. This is scarcely credible since the theme, scope and style of the two poems are so different as to render comparison rather meaningless save with regard to interest and to the level kept by the poet's imagination, points in which the superiority of ‹Paradise Lost› is manifest. On the other hand, ‹Paradise Regained› in its poised nobility and its artistic use of the materials furnished by the Gospel narratives of the Temptation is so perfect of its kind that Milton's indignation at hearing it undervalued is easily comprehended. ‹Samson Agonistes› has fared better at the hands of critics and readers. It is probably the most successful tragedy of the Greek type ever written by an English, if not a modern, poet, and it is certainly full of the unquenchable spirit of its author. Samson blind, in the midst of his enemies, the victim of his own infatuation for a woman, was a hero with whom Milton, of all men, could thoroughly sympathize.

The poet's health was now undermined by the gout, and he devoted his closing years to setting his miscellaneous writings before the world in a proper shape. Besides the academic publications already mentioned, he revised his early poems in 1673, adding to them a few youthful pieces and some of his later sonnets, and the next year he collected his Familiar

Epistles, with his College Exercises. On 8 Nov. 1674 he died peacefully, and four days later he was buried in Saint Giles, Cripplegate, beside his father. It may be inferred that some of the obloquy once heaped upon him had been dissipated, since his funeral was well attended. His daughters, who had not made his life pleasant, and whom he had employed as readers in languages they could not understand, and had not educated or perhaps appreciated as a schoolmaster and man of such refinement might have been expected to do, disputed with his widow the terms of his nuncupative will, but the matter was finally compromised. The widow survived till 1727, a date at which all trace of the poet's descendants through certain Clarkes in India seems to have been lost. The granddaughter for whose benefit ‘Comus’ was performed in 1750 had buried her seven children in infancy. Nor was the poet's progeny short-lived only; it appears to have sunk decidedly in the social scale.

From the portraits and descriptions of Milton it may be gathered that he was somewhat short and well made, with light hair and clear-cut features. He was stately in his manners, dressed neatly, was temperate and methodical in his habits, which were those of the student rather than of the artist, although he kept up his music to the end of his life. He was on pleasant terms with a small group of friends, and was accessible to foreigners of distinction. He took regular exercise and indulged in an occasional pipe. Perhaps his only striking eccentricity — for in such an age of confusion his religious and political radicalism should not excite surprise — was his adoption of the notion that his creative genius worked freely only from the “Autumnal Equinoctial to the Vernal.” It is at least fairly certain that his poetical powers were not so distinguished for affluence as for felicity and strength. When he was in the mood for composing (in his latter years) he seems to have stored up passages in his memory and to have dictated them by batches of 20 and 30 lines to any chance amanuensis he could secure.

Milton's position in English literature, as settled by popular consent, would seem to be not far below Shakespeare and well above all other authors. He has had and has adverse critics, however, while a few persons would place him at least on an equality with Shakespeare in greatness. As a conscious poet artist he has not been clearly surpassed in the literature of the world; he is doubtless the consummate master of the sublime; and he has few equals as a writer of erudite and sonorous prose. As an exponent of idealism in conduct he is almost as memorable as he is in his function of poet; as an inspired and inspiring patriot of liberal mold he is practically unparalleled. In total range of appeal as poet, scholar, patriot and man his closest students are seldom willing to admit his inferiority to any other mortal.

The titles and dates of the main works published by Milton during his life have already been given. To these should be added, as posthumous publications, a surreptitious collection of ‘Letters of State’ (1676, translated by Phillips, 1694); ‘A Brief History of Moscovia’ (1682), and ‘J. Miltoni Angli de Doctrina Christiana Libri duo posthumi’ (edited by Sumner, 1825). This treatise on ‘Christian Doctrine,’ the manuscript of which went through curious adventures, gives formal justification to the idea that Milton developed a sort of semi-Arianism, traces of which have been discerned in ‘Paradise Lost.’ Milton's ‘Commonplace Book,’ edited in 1876 and 1877 (for the Camden Society), seems to include nothing original. The manuscript now in the library of Trinity College, Cambridge, which contains the lists of subjects for a long poem and copies of several early poems, including ‘Comus’ and ‘Lycidas,’ was published in facsimile in 1899. Several productions have been attributed to Milton on but slight grounds, the latest being a romance in Latin, ‘Novæ Solymæ Libri Sex’ (1648), resuscitated by the Rev. Walter Begley and translated and published by him in 1902. The real author appears to have been Samuel Gott. See Areopagitica; Comus; Il Penseroso; L'Allegro; Lycidas; Paradise Lost; Paradise Regained; Samson Agonistes.

Bibliography.—Among the most important editions of Milton's poetical works are those of Newton (1749–52), Todd (1801, 1809), Sir Egerton Brydges (1835), R. C. Browne (1870, 1901, the English Poems), Masson (1874, 1877, 1882), Bradshaw (1892 — the New Aldine), W. V. Moody (1899), H. C. Beeching (1900), and W. Aldis Wright (1903). The Aldine edition of 1832, with a life by John Mitford, should also be mentioned, as well as Bentley's curious edition of ‘Paradise Lost’ (1732), and Thomas Warton's excellent edition of the so-called Minor Poems (1785, 1791). Editions of separate poems, especially for school purposes, are very numerous. Of the prose works the following editions may be noted:— Of John Toland (1698), T. Birch (1738), T. Birch and R. Barron (1753), C. Symmons (1806), R. Fletcher (1833), R. W. Griswold (1847), J. A. St. John (Bohn's Standard Library, 5 vols., 1848–53, including the ‘Christian Doctrine’), J. Mitford (1851, 8 vols., including the Poems, but not the ‘Christian Doctrine’). There is no thoroughly good modern edition of the complete works; but there has been of late more attention given to the prose. Consult elaborate editions of tracts in ‘Yale Studies in English’ and E. Lockwood's ‘Of Education,’ etc., containing reprints from the earliest biographies of Milton (Boston 1911). There are concordances to the Poems by G. L. Prendergrast, C. D. Cleveland (1867) and John Bradshaw. ‘A Lexicon to the Poetical Works of John Milton,’ by L. E. Lockwood, was published in 1902.

The standard biography of Milton is the monumental work of Professor Masson (6 vols., 1859–80). Most of the editions mentioned above contain memoirs, which in some cases are very elaborate, e.g., that by Mitford in the edition of 1851. Of the early memoirs, that by Milton's nephew, Edward Phillips, was prefixed to his translation of the Letters of State (1694), and that by Toland to his edition of the prose works (1698). Later lives are by Thomas Keightley (1855), Alfred Stern (‘Milton und Seine Zeit,’ 1877–79), Mark Pattison (1879, in the English Men of Letters), Stopford Brooke (1879, in Classical Writers), and Richard Garnett (1890, in Great Writers, with a bibliography). Dr. Johnson's famous life in the ‘Lives of the Poets’ influenced public opinion against Milton until the tables were somewhat turned by Macaulay's enthusiastic essay in the *Edinburgh Review* (1825). The number of essays and monographs and books dealing with special topics connected with Milton's life and works is, of course, very large, e.g., 'Milton's Prosody' (1893, 1901), by the poet Robert Bridges, Edmundson's 'Milton and Vondel' (1885); Spaeth's 'Milton's Knowledge of Music' (1913); Myers' 'Relations of Latin and English during the Age of Milton' (1913), and Bailey's 'Milton and Jakob Boehme' 1914). Important critical discussions of moderate length may be found in the collected works of Matthew Arnold, Walter Bagehot, the elder William E. Channing, S. T. Coleridge, De Quincey, Emerson, Lowell and Macaulay. To these critics may be added Augustine Birrell, Edward Dowden, Edmund Scherer and Sir Leslie Stephen. Special volumes dealing with the poet are Hiram Corson's 'Introduction to the Works of Milton' (1899), W. P. Trent's 'John Milton: a Short Study of his Life and Works' (1899); Walter Raleigh's 'Milton' (1900); Alden Sampson's 'Studies in Milton' (1913), and Thompson's 'Essays on Milton' (1914). The chief histories of English literature, such as Taine's and that by Garnett and Gosse, as well as Saintsbury's 'Elizabethan Literature,' and the 'Cambridge History of English Literature,' should also be consulted. An excellent edition of Johnson's life, the merits of which should not be underrated, is now provided in Dr. Birkbeck Hill's edition of the 'Lives of the Poets,' in three volumes (1905). The Milton tercentenary, celebrated in 1908, was the occasion for the publication of a 'Catalogue' of the exhibition held in London in that year, and of the 'Milton Memorial Lectures,' edited by Percy W. Ames. The course of Milton's fame may be traced in J. W. Good's 'Studies in the Milton Tradition' (Urbana, Ill., 1915). For further bibliographical information consult E. N. S. Thompson's 'John Milton Topical Bibliography' (New Haven 1916).

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MILTON, John, soldier and politician: b. Jefferson County, Ga., 21 April 1807; d. Tallahassa, Fla., 1 April 1865. Milton received a good school education, studied law and practised with success in Columbus, Mobile and New Orleans. As a captain of volunteers he took part in the Seminole War. In 1846 he engaged in cotton planting in Florida, but maintained a lively interest in public affairs, serving (1849) as a Democrat in the State senate and in numerous party positions. He favored secession and in 1861 was elected governor for a four-year term. During the Civil War Milton raised, outfitted and dispatched troops, collected supplies and provided for the defense of the State. Much distressed at the misfortunes of the Confederacy, Governor Milton's mind gave way and he died soon after.

MILTON, Canada, town, in Ontario, and capital of Holton County, on the Canadian Pacific and Grand Trunk railways, about 30 miles southwest of Toronto. Its industries and manufactures are lumber, flour, wire, nails, cream, boots and shoes, pressed brick, crushed stone and lime, wood, screws, rivets, carpets, nickel and silver plating, electric motors. Milton has two parks, waterworks and electric lighting. Pop. 1,654.

MILTON, Mass., town in Norfolk County, seven miles south of Boston, on the Neponset River and the New York, New Haven and Hartford Railroad. Milton is an attractive and wealthy residential suburb of Boston, valued in 1914 at $31,602,839 and occupying about 13 square miles. A portion of the Blue Hills belongs to Milton. On Great Blue Hill (625 feet) fires were kindled on the news of the repeal of the Stamp Act; of the adoption of the Declaration of Independence; and on the surrender of Burgoyne and Cornwallis. Beacon fires burned here during the Revolutionary War. At an early date an observatory for tourists was erected on Great Blue Hill and in 1885 the Blue Hill Observatory for meteorological investigations was established by Abbott Lawrence Rotch (1861), who made important investigations regarding clouds. Milton Academy was founded in 1798 and a public library was opened in 1871. Milton owns two granite quarries and two public parks: Cunningham Park and Hutchinson Field, the latter on a portion of the estate of Thomas Hutchinson, a colonial governor of Massachusetts. Milton was settled in 1640. It was originally a part of Dorchester and was called Uncataquisett. The town was separated in 1662 and incorporated. It owes its name either to Milton Abbey, Dorset, from which members of the Tucker family emigrated, or to the number of mills established here — Mill Town. It was the residence of two colonial governors — Jonathan Belcher and Thomas Hutchinson. In 1712 the Blue Hill lands were divided between Milton and Braintree. In 1868 part of Milton was given to the new township of Hyde Park. Milton now includes the village of East Milton, Lower Mills and Mattapan. Milton was brought into political importance during the early days of the Revolution by the passage of the famous «Suffolk Resolves.» These bold resolutions were passed on 9 Sept. 1774, at a meeting of the citizens held in the house of Daniel Vose, these men having adjourned from Dedham. The «Suffolk Resolves» declared that a sovereign who breaks his contract with his subjects forfeits their allegiance; that the repressive measures of Parliament were unconstitutional; that tax-collectors should not pay over money to the royal treasury; that the towns should choose public officers from the patriot party; that they would obey the Continental Congress; that they favored a provincial congress; that they would seize Crown officers as hostages for any political prisoners arrested by the governor; and they recommended that all persons in the colony should abstain from lawlessness. Consult Teele, A. K., 'History of Milton, Mass.' (Milton 1887).

MILTON, Pa., borough, in Northumberland County, 50 miles north of Harrisburg, on the Susquehanna River. It is situated on the Pennsylvania and the Philadelphia and Reading railroads and on the Pennsylvania Canal. The scenery is picturesque and a fine bridge spans the river. Milton was settled in 1792 and incorporated in 1817. It is governed by a revised charter of 1890 and has a chief burgher, elected every four years, and a council. Its industries and manufactures are rolled iron, lumber, cars, wood-working, machinery shops, nails, nuts, bolts, furniture, shot, flynets, bamboo novelties and paper-boxes. It suffered from a severe fire in 1880. Pop. (1920) 8,638.

MILTON, Wis., village, in Rock County, on the Chicago, Milwaukee and Saint Paul Railroad, eight miles northeast of Janesville, in a grain-growing district. It is the seat of Milton College (Seventh Day Baptist). Fountain pens are manufactured here. Pop. 873.

MILTON COLLEGE, in Milton, Wis., a coeducational institution, was founded in 1844 by pioneers from Eastern States, the most of whom were Seventh-Day Baptists. It was first known as Du Lac Academy; in 1848 it became incorporated; in 1854 the name was changed to Milton Academy; and in 1867 it received its charter as a college. The influence of Milton College is Christian rather than sectarian, although it has always maintained a closely sympathetic relation to the Seventh-Day Baptist people. It is strictly a college of liberal arts, of general culture. In 1916 it reported 16 professors and instructors; 135 students; over 10,000 volumes in the library; grounds, buildings and apparatus, valued at $85,000; productive funds, nearly $150,000; total income for the year, $15,500. The number of graduates up to 1916 was over 400.

MILUTIN, Dmitri Alexievitch, COUNT, Russian field-marshal: b. 1819; d. Yalta, Crimea, 5 Feb. 1912. The son of poor parents, he entered the army in 1833 and studied at the Military Academy in Saint Petersburg (Petrograd), where he became professor of geography. His first active service was in the Caucasus against Schamyl. From 1861 to 1881 he was Minister for War, during which long period he introduced important reforms, especially the establishment of conscription in 1874. He took part in the Russo-Turkish War in 1877–78 and for a time added the duties of Foreign Minister to his own. He retired in 1881 and devoted himself to writing military history.

MILVAIN BRIDGE, or MULVAIN BRIDGE, ancient bridge over the Tiber at Rome built in 109 B.C. by Marcus Æmilius Scaurus on the famous Flaminian Way. Here Cicero had the ambassadors of the Allobroges arrested (60 B.C.) who were conspiring with Cataline; and here Maxentius was drowned after his defeat by Constantine (312 A.D.). The modern Ponte Molle now spans the Tiber in place of the Milvain Bridge. Consult Platner, S. B., 'The Topography and Monuments of Ancient Rome' (2d ed., New York 1911).

MILWAUKEE, mĭl-wâ'kē, Wis., capital of Milwaukee County and the metropolis of the State; on the west shore of Lake Michigan, at the confluence of three rivers — Milwaukee, Menomonee and Kinnickinnic. The converging streams flow into a bay of great natural beauty, which extends nearly three miles inland and affords excellent harborage for vessels within the shelter of two miles of breakwater constructed by the Federal government.

Topography.—A distance of six miles separates the high north and south headlands that mark the extremes of the bay. The intervening shore, except around the deltas formed by the disemboguing streams, is a series of bold bluffs that overlook the harbor from an altitude varying from 85 to nearly 150 feet above Lake Michigan, thence sloping gradually to the lower levels of the rivers that enter the city from the north, south and west respectively. The river bottoms were, half a century ago, stretches of wild-rice marshes and tamarack swamps, but the leveling processes prompted by business necessities have transformed them into solid ground whereon the chief business section has been built. The residence districts are located on the higher altitudes above the three valleys formed by the streams that trisect the city.

Trade and Industries.— Milwaukee's excellent harbor has been the leading factor in promoting the commercial and industrial growth of the city. Three navigable rivers, the Milwaukee, Menomonee and Kinnickinnic, which merge at a common mouth, afford, with connecting canals and slips, about 20 miles of water frontage. A large proportion of the frontage on the Milwaukee River, however, is occupied by mercantile structures which face thoroughfares paralleling the river. The Menomonee River, which flows from the west and has a navigable length of about two miles, carries the major portion of the tonnage of the port. The Kinnickinnic River, extending southerly about two and three-quarters miles, is next in this respect, while the Milwaukee River, reaching to the northward about two miles, ranks third. The rivers average from 140 to 225 feet in width and have a maximum depth of 20 feet.

Coal represents the greater portion of the receipts of the port, and grain and miscellaneous freight of the shipments. In normal times the total inbound and outbound tonnage aggregates between eight and nine million tons with a combined valuation of close to $150,000,000. Governmental statistics rank Milwaukee as the second largest coal receiving port on the Great Lakes. The port holds first place in point of number of arrivals and departures, second place as to valuation of freight tonnage and third place in the matter of shipments of flour and grain and grain products.

In addition to the coal and grain trades, a large volume of general merchandise is transported by steamers which run to Georgian Bay and ports on Lake Erie. Two carferry lines maintain service throughout the entire year to and from ports on the east shore of Lake Michigan, where direct connection is made with railways to the East. These ferries carry 30 railway cars each and make daily trips. In addition to the carferry service, two steamboat companies operate passenger and freight steamers to across-the-lake points practically the year round. Passenger and freight steamers also ply daily between Milwaukee and Chicago and also make trips to points north, including Green Bay ports.

A feature of Milwaukee harbor is an outer anchorage basin, or harbor of refuge, formed by a sea wall extending southeasterly from the north point of the bay. The protected area available for the use of vessels is about 270 acres with a depth ranging from 16 to 32 feet. Plans are now being prepared under the direction of the harbor commission for the development for harbor purposes of the lake front from Wisconsin street on the north to Russell avenue on the south, a distance of about two miles, and also the inner side of a peninsula known as Jones Island, at an estimated cost of from five to six million dollars. The project contemplates municipally-owned terminals of every nature, and has for its purpose the accommodation of the increased traffic of the future and the diversion of as much business as is possible from the present congested and closely bridged channels to the more accessible deep-water district above named.

The chief industries of the city, in the order of their importance as regards annual product, are leather, $54,007,415; slaughtering and meat packing, $44,949,676; foundry and machine shop products, $36,345,673; engines, steam, gas and water, $31,867,356; boots and shoes, $30,007,285; knit goods, $24,015,467; confectionery and ice cream, $16,816,309; electrical machinery, apparatus and supplies, $16,577,685; wheat shipments exceed 9,000,000 bushels annually. From 1880 to 1890 the total product of the city's industries increased 147 per cent; from 1890 to 1900, 88.6 per cent; 1900 to 1910, 88.8 per cent; 1910 to 1915, 21.8 per cent; 1914 to 1919, 162 per cent.

The manufacturing statistics in 1919 were as follows: Persons employed, 84,222; paid in wages, $113,820,814; capital employed, $350,222,365; value of products, $576,161,312; the value of products increased 80.7 per cent.

Population.— Within the city's corporate limits are comprised 24 square miles, a smaller area than that of any other city of considerable population in the United States. The first enumeration, in 1838, revealed a population of 700, which had increased to 9,666 by the date of the incorporation of the city in February 1845. The number of inhabitants according to the Federal census of 1900 was 285,370. During the next decade (1910) it increased to 373,587. **The population (U. S. official) in 1920 was 457,147.** The great bulk of the residents are workingmen, and it is estimated that fully 80 per cent of them own their own homes. Local banking statistics show savings deposits aggregating $45,409,476, of which 75 to 80 per cent are estimated to be those of wage-earners. There has been no considerable strike in Milwaukee since the general labor disturbance of 1885, except a walk-out of street car employees in 1896. The population of the city is polyglot. A map of the city with division lines determined by the predominating nationalities inhabiting certain districts would bear much resemblance to that of Europe as to nomenclature. For many years the population was largely of German birth, and Milwaukee acquired the title of the «German Athens of America.» The first German settlers came in 1838, but it was not until 1845 that large numbers of Germans began to make the young city their home. For nearly half a century their customs found expression in the chief social life of the city. At one time the number of daily newspapers printed in German was nearly twice the number printed in the English language. A theatre was built expressly for performances in German, with stock companies drawn from Germany. A German market hall was constructed. Six turner halls were erected, and a seminary for students of physical training was established. During the Civil War, one company of volunteers was composed wholly of German turners. The tide of German immigration was followed, beginning 40 years ago, by a stream of Poles, Dutch, Scandinavians and Bohemians, and more recently Italians and Syrians have established colonies in certain sections of the city. The preponderance of German population has now disappeared, although certain wards remain largely German. The foreign-born inhabitants are grouped in various sections of the city. German, Polish, Bohemian and Scandinavian papers and periodicals are published in Milwaukee, including two dailies in the Polish and one in the German language. The first Polish daily paper established in the United States was printed here.

Churches.— The seat of a Catholic archbishopric and of a Protestant Episcopal bishopric are located in Milwaukee. The 206 churches are distributed among the following faiths and creeds: Adventist, 1; Baptist, 9; Catholic, 45; Christian, 2; Christian Science, 4; Congregational, 4; Episcopal, 10; Evangelical, 10; Evangelical Association, 7; Greek, 1; Italian Evangelical, 1; Jewish, 8; Lutheran, 60; Free Lutheran, 1; Methodist Episcopal, 20; Free Methodist, 1; Mormon, 1; Presbyterian, 12; Reformed, 3; Serbian, 1; Spiritualistic, 3; Syrian, 1; Unitarian, 1. The property of the religious organizations is valued by the tax commissioner at $10,878,380. Some of the church edifices are architecturally beautiful, notably Saint Paul's Church, in the Norman style; Saint Josaphat's, Byzantine; Gesu, Immanual and Saint James, Gothic. The convent of Notre Dame, which occupies a square in the heart of the city, is the mother house of the order in the United States. In the suburb of Saint Francis the Catholic seminary of Pio Nono is surrounded by a magnificent tract of 200 acres. Marquette University (Jesuit) and Concordia College (Lutheran) are located on the west side.

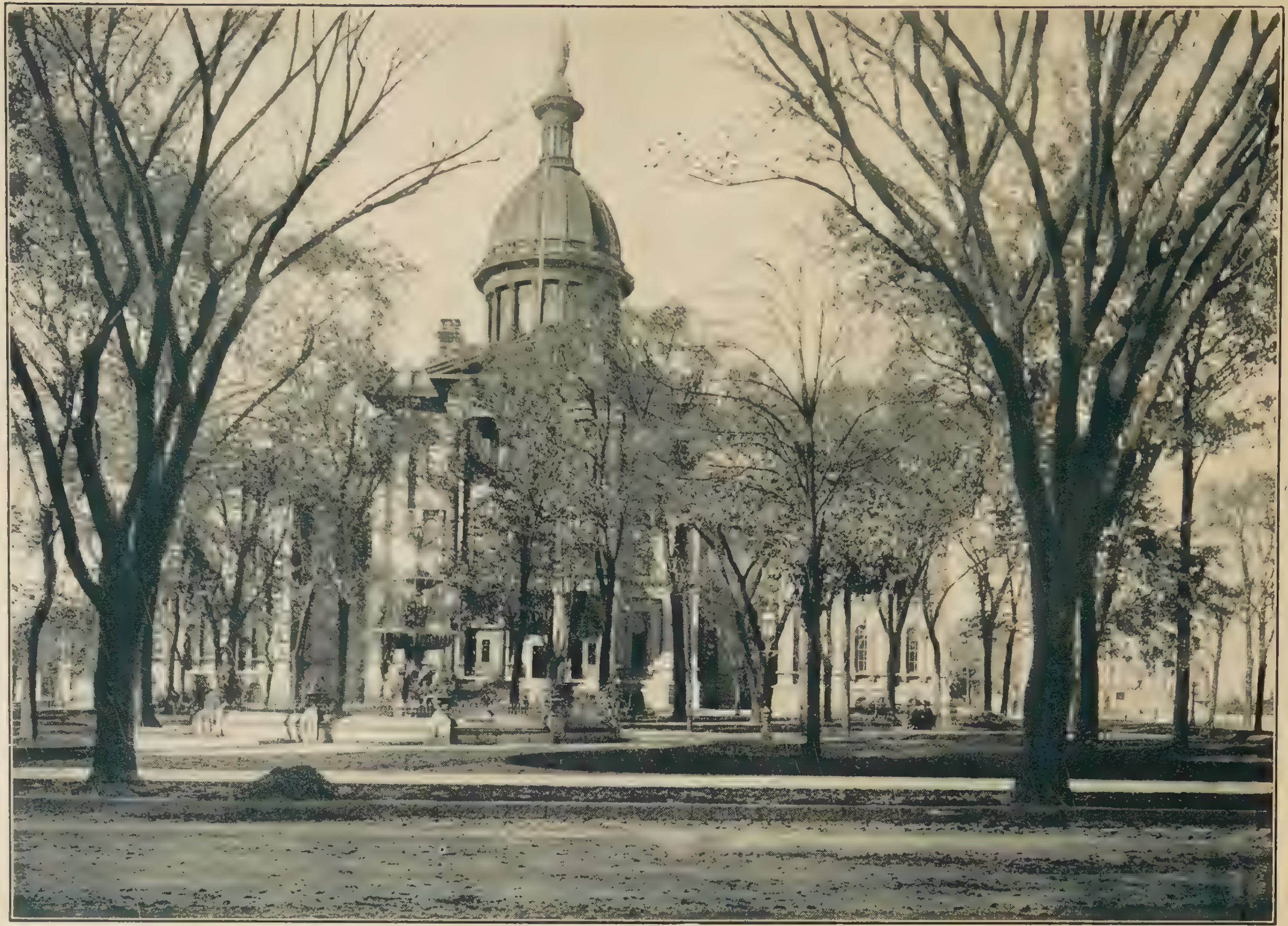
Government.— The elective city officers are the common council, mayor, city attorney, city treasurer and city comptroller. In addition to these are the various appointive officials, including the commissioner of public works, commissioner of public health, tax commissioner, inspector of buildings and the chiefs of the fire and police departments. The common council, as constituted in 1918, consists of 37 members, 25 of whom are elected by wards for a term of two years. Twelve are elected for terms of four years by the city at large. In 1920, according to an amendment to the city charter adopted in April 1918, the council will be reorganized to consist of 25 aldermen, elected by wards for a term of four years each. The distinctive feature of the government of Milwaukee is the board or commission plan. An increasing number of these boards have been created with broad administrative powers, in most cases entirely independent of the common council, except in the matter of financial supervision. Chief of these is the school board, which consists of 15 members elected by the people at large, and entirely independent of the common council even in its financial transactions. Other boards are the park board, library board, sewerage commission, museum board, central purchasing board and the board of city service commissioners, all of which control the city activities indicated by their names. The members of these boards are in most cases appointed by the mayor subject to the approval of the council.

Public Works.—The water works property valued at $8,906,170 is owned by the city, the entire cost of construction and maintenance having been paid out of its proceeds, and its surplus revenues aid in defraying other municipal expenses. Following a comprehensive survey of street lighting systems and problems, a system of electric light distribution, unique both in practical efficiency and artistic beauty, has been designed and is now being installed. An incinerator for consuming garbage, which is collected by the city without charge, is in operation. A free emergency hospital, originally a private benefaction, is maintained at public expense, likewise six large natatoriums throughout the year, and in the summer two free public bath-houses on the lake beach. In addition to triangles, squares and boulevards, there are 13 parks of which the total acreage is 939. These parks vary in size from 6 to 180 acres. During the winter months free public evening lectures for adults are given in public school halls, the expense being borne by the school extension fund. A city hall was completed in 1896 at a cost of $1,016,935, and the library and museum building is valued at over $2,000,000, with contents. The library contains 351,848 volumes. There are 397,607 specimens in the museum, as well as 24,565 books, pamphlets and maps, and 17,310 lantern slides. The city is constructing a system of intercepting sewers and the sewage commission is conducting extensive experiments in the activated sludge system of sewage disposal.

Education.— Milwaukee is splendidly equipped with educational facilities. Its public school system is composed of six high schools, 64 district schools, a trade school for girls, a boy's technical high school and a day school for the deaf. There is an open-window school for children who are below normal. Special classes are provided for blind and crippled children. The girls' trade school, with classes in sewing, dressmaking and cooking, has an average membership of 421. In addition to the public school system, there are, including Lutheran and Catholic institutions, 58 private parochial schools. Marquette University for men includes in its curriculum not only general academic courses but fine schools of medicine, law and engineering. Milwaukee Downer College, for women, has a well-deserved reputation throughout the Middle West. The State of Wisconsin has located a normal school in the city, which offers regulation courses for teachers as well as training for kindergarteners, music teachers and teachers of art. The Extension Division of the University of Wisconsin maintains an office in Milwaukee which offers unusual opportunities to the student.

History.— The first permanent settlement of Milwaukee is usually dated from 1818, when Solomon Juneau erected his little log cabin on the east side of the Milwaukee River. French and English traders had been here before that date, and a procession of Jesuit priests and French voyageurs had preceded them. The first recorded visit of a white man on the site of the future city is in the journal of Father Zenobe Membré, a Recolle missionary priest who accompanied Robert Cavalier de la Salle on his memorable exploratory trip from Lake Erie to the Illinois country in 1679. He notes that both Mascoutens and Foxes were dwellers «on the banks of the river called Melleoki.» John François Buisson de Saint Cosme journeyed in 1699 along the west shore of Lake Michigan from Michilimackinac to the Mississippi. «On the seventh,» he wrote, «we arrived at Melwarik (Milwaukee). This is a river where there is a village which has been considerable and inhabited by the Mascoutens and Foxes, and even some Pottawattamies.» The word Melleoki and its numerous variants, which by a process of evolution has become Milwaukee, is of Pottawattamie origin and signifies «good land.» Another definition accepted by some historians is «council place,» this having been regarded as neutral territory by different tribes of Indians. The dwellers in the old Indian village were evidently a turbulent set, for Col. Arent de Peyster, commandant at Michilimackinac, wrote of them in the early years of the Revolutionary War as «runagates — a horrid set of refractory Indians.» Lieutenant James Gorrell, whose British regulars occupied the stockade at Green Bay in 1762 and gave it the high-sounding title of Fort Edward Augustus, wrote the name of the place as «Milwacky.» An English trader lived among the Indians at this place in that year. Fur traders made brief stays in the village from time to time. Alexander Laframboise and his brother were located as traders here in 1785, with a large stock of goods. In 1795 Jean Baptiste Mirandeau, a Canadian blacksmith who had married an Indian woman, built a cabin and made himself useful to the Indians by mending their firearms. He received as compensation game and furs. He died in 1819, being survived by a family of 10 children, who joined the Indians when the Milwaukee band was removed. Thomas Gummersall Anderson, the son of a Loyalist, was a resident upon the site of the future city of Milwaukee from 1803 till 1806. He took an active part in the capture of Prairie du Chien by the British during the War of 1812. When Solomon Juneau arrived in 1818 he found a Pottawattamie village. He settled on the east side of the Milwaukee River, which later was called Juneautown; the west side of the river became Kilbourntown, after Byron Kilbourn (1834), and George H. Walker gave the name of Walker's Point (1834) to the region south of the Menomonee River. Each of the three natural geographical divisions became the nucleus of a little community, and acrimonious rivalry was a natural resultant. The different names of streets on opposite sides of the rivers, now connected by 28 bridges, are a survival of the bitter feelings then engendered. The village of Milwaukee, now the East Side, was organized 27 Feb. 1837; Kilbourntown, now the West Side, was annexed 11 March 1839; and Walker's Point, now the South Side, 5 Feb. 1845. The city was incorporated 5 Feb. 1845, and Solomon Juneau chosen first mayor.

Bibliography.—Anderson and Bleyer, ‹Milwaukee's Great Industries› (1892); Barton, ‹Industrial History of Milwaukee› (1886); Buck, ‹Pioneer History of Milwaukee› (4 vols.,



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COUNTY COURT HOUSE, MILWAUKEE

1876, 1881, 1884, 1886); Chapman, ‘In and Around Milwaukee’ (1896); Conrad, ‘History of Milwaukee from its first Settlement to 1895’ (1895); Flower, ‘History of Milwaukee, Wisconsin, from Prehistoric Times to the Present Date’ (1881); Frank, ‘Medical History of Milwaukee’ (1915); Gregory, ‘Early Political History’ (1895); Holton, ‘Commercial History of Milwaukee’ (1858); La Piana, ‘Italians in Milwaukee’ (1915); Lapham, ‘Documentary History of the Milwaukee and Rock River Canal’ (1840); Larson, ‘Financial and Administrative History of Milwaukee’ (1908); Morrison, ‘Milwaukee's History’ (1892); Odell, ‘Industrial Milwaukee’ (1903); ‘Sentinel Almanac and Book of Facts; a cyclopedia of history and statistical facts’ (1897–1900); Wheeler, ‘Chronicles of Milwaukee’ (1861); Wight, ‘Annals of Milwaukee College’ (1848–91).

Chas. E. McLenegan,
Public Librarian.

MILYUKOV, Pavel Nikolaevitch, Russian historian, educator and political leader: b. near Saint Petersburg, 1857. Educated in Moscow he became a tutor in history at the university in 1886–95. Because of his liberal views regarding political reforms he was banished from Russia. He then went to Bulgaria and became professor of history at the University of Sofia. In 1897–98 he traveled in Europe and then came to the United States. Settling in Chicago he lectured on Russian subjects at the University of Chicago. A course of lectures delivered there was published in 1905 under the title of ‘Russia and Its Crisis.’ In 1905 Milyukov returned to Russia on the outbreak of the revolutionary movement to further the cause of liberty. He was imprisoned for a while, but on his release resumed his activities and was instrumental in forming the Union of Unions (composed of the educated and professional classes). He was elected to the first Duma as a Constitutional Democrat, which party (universal suffrage and constitutional government) he had created. While the Duma was in session he was arrested. After a month's imprisonment he was liberated. He was a member of the Balkan Committee of Inquiry which investigated the conduct of the war of 1913. Milyukov edited the Constitutional Democrat papers, the *Free Nation* and *Popular Rights,* until they were suppressed by the Russian authorities. Then he became editor of the Petrograd newspaper called *Rech.* Besides a vast number of essays and magazine articles Milyukov has published many books. These include ‘Main Currents of Russian Historical Thought’ (1893–95); ‘Sketches of the History of Russian Culture’ (1895–96); ‘Russia and its Crisis’ (1895); ‘Democracy and the Second Duma’ (1905); ‘A Year of Struggle’ (1907); and ‘The Balkan Crisis and Politics’ (1910).

MÎMÂNSÂ (from the Sanskrit *man,* to investigate), investigation, is the collective name of two of the six divisions of orthodox Hindu philosophy. The two Mîmânsâ divisions are: (1), the Pūrva-mîmânsâ (Prior Inquiry, or Karma-mîmânsâ), investigation concerning works that deal chiefly with the Vedic ritual and its significance; and (2), Uttara-mîmânsâ (Later Inquiry, or Brahma mîmânsâ), investigation concerning the Supreme Spirit, or, more commonly, Vedanta (see Vedanta Philosophy), dealing with speculations on the nature of the Supreme Spirit. The principles are embodied in a series of *Sutras,* or aphorisms, in 12 books, discussing the sacred ceremonies of the Veda and the merit accruing from their proper performance. Although the Mîmânsâ is ranked by all Indian writers with the other philosophical systems, the term philosophy can hardly be applied to it in the same sense as to the other systems of philosophy. The object of the Mîmânsâ is merely to lay down a correct interpretation of such Vedic passages as refer to the Brahmanic ritual; to solve doubts wherever they may exist on matters concerning sacrificial acts and to reconcile discrepancies (or *seeming* discrepancies) of Vedic texts. Jasmini, a sage, was the founder of this school of interpretation. The standard introduction to the study of the Mîmânsâ is by Mâdhava Achâeya. Consult Cowell and Gough, ‘The Sarva-Darsana-Samgraha of Mâdhava-Acharya’ (London 1894). The oldest extant commentary on the Mîmânsâ is the Bhashya of Cabara-Svanim, written before the birth of Christ. This commentary was annotated about 700 A.D., by Kumarila, a great authority on Indian philosophy. Colebrooke published a treatise on this subject in 1826, which was published in his ‘Miscellaneous Essays’ (London 1873). The subject is finely treated in ‘The Six Systems of Ancient Indian Philosophy,’ by Max Müller (New York 1903). Consult also Macdonell, ‘Sanskrit Literature’ (London 1913).

MIMBRES RIVER. A stream rising on west slope of Mimbres Mountains in the northern part of Grant County, N. Mex., flowing south across Luna County near Deming and disappearing in the wide desert flat east of Florida Mountains. This flat is separated from Rio Grande Valley but to the south opens into the wide basin which contains Lake Guzman in Sonora, Mexico. The river has running water in Grant County, but excepting in time of freshet is dry in Luna County. The name is Spanish for osier or water willow which grows in the upper part of the valley.

MIME, a dramatic entertainment, native to Sicily and Magna Græcia, and appealing to popular taste by its scurrilous caricatures of low life. Originally performed in public squares on festival days, it was later developed into artistic form by Sophron Syracuse in the 5th century B.C. The ‘Mimiambi’ of Herondas (q.v.), a Greek poet of perhaps the latter half of the 3d century B.C., representing the everyday life of the common people, furnish trustworthy examples of these literary mimes. The Romans adopted the mime in its unliterary form as early as the 3d century B.C., but it was not until Cicero's time that it received a place in literature at the hands of Decimus Laberius and Publius Syrus, of whose works we have fragments. As an after-piece, and under the empire as an independent performance, it was as popular as it was indecent in words and action.

MIMETITE, a mineral consisting of a lead arsenate and chloride closely resembling pyromorphite, occurring in hexagonal crystals. In color mimetite is usually yellow, or brown, rarely white, or colorless. Like pyromorphite, mimetite is found in the upper parts of veins of lead ore where it has been formed by the oxidation of galena and mispickel.

MIMICRY IN ANIMALS. One of the ways by which species and groups of animals are perpetuated. Its effect is to assure the safety of individuals by reason of their having such a likeness to something else that the eye of another animal seeking to do them harm overlooks them, by mistaking their real nature for the object mimicked, so that the enemy passes on. This is one of the phases of «protective resemblance,» of which the two principal are: (1) *Mimicry,* similarity in form to some inanimate object; (2) *Imitation,* similarity to another animal that for some reason is immune from attack by the enemies of the imitating species. In both cases color is likely to serve as an important element in the practical deception. See Coloration, Protective; Imitation.

These two phases, and other manifestation of deception for safety's sake, are regarded by the exponents of the Darwinian theory of organic evolution as results of the gradual and unconscious acquirement, through the process of natural selection, of changes advantageous to the animal in its struggle for existence. The present article considers such beneficial results as have been obtained by acquiring by certain animals a resemblance to some vegetable or inanimate article of no interest or value to the enemy.

It is plain that if a moth or a caterpillar sitting on a tree-trunk can be mistaken by a bird or lizard for a bit of lichen or a dried twig it may frequently be passed by, and thus allowed to live long enough, perchance, to perpetuate its species. This happens actually in nature. Mimicry is developed, however, almost exclusively in small creatures that are otherwise defenseless; and sometimes is restricted to the young of a species whose individuals when adult can either take care of themselves well or develop some special method of concealment or passive resistance. It also occurs in a few plants.

It is mainly exhibited by insects, but is manifest in some marine animals, for example sea-anemones, which when closed are to all appearance lumps of mud; and many hydroids have a most deceiving resemblance (in our eyes, at least) to the seaweeds on or amid which they grow; while a pipe-fish, standing on its head, among the eel-grass alongshore, as is its custom, is as effectually concealed as anything can be. A few large examples might be cited, as the mata-mata turtle of South American rivers, which is so tagged and fringed with outlying processes that it has the exact appearance of a weedy rock; but in this case, as in some others of mimicry, the advantage is more that the turtle's prey (fishes, etc.), will come near enough to be seized before they suspect its fatal presence, than that the turtle itself will be safer.

Mimicry is most prevalent, however, among insects and spiders. These are to be found in all countries with deceptive resemblance to withered, gnawed or moldy leaves; to bits of twig, particles of dung, cocoons whose contents are breaking out; or to any of various objects under which insects seek refuge or concealment, as flakes of bark or bits of stone. The records of observation in the books of Darwin, Wallace, Bates, Fritz Müller, Semper, Belt, Forbes and other naturalists abound in instances, many of which were discovered by the merest accident. The classic example is the amazing likeness of a kind of butterfly of the East Indies, when at rest, to a leaf which extends not only to the general color of the under surface of the closed wings and their markings, but to the attitude of the insect as it alights, for it places itself in a relation to the branch to which it clings precisely similar to the natural arrangement of the real leaves about it; and, of course, frequents only the one kind of tree whose leaf is mimicked. A tropical «walking-stick» insect has flat extensions of the skin along its legs and body which are so shaped, and so mottled in color, that Wallace found even the sharp-eyed Dyak boys of the Bornean forest deceived into thinking this insect «a stick grown over by a creeping moss.» But our own northern, greenish-brown walking-sticks are sufficiently deceptive in their twig-like aspect when, as is their custom, they sit on a bush-branch, holding their bodies stiffly out at an angle with their fore legs stretched straight in front of their heads; many must be overlooked for one that is detected. More familiar, perhaps, are the measuring-worms (hairless caterpillars of geometrid moths) which, clasping a branch firmly by their hind legs, will stand out rigidly from it, and maintain this attitude for hours. Their dull gray color gives them exactly the appearance of a broken twig, and as long as they remain motionless they are virtually safe. The whole race of mantids exhibit this character in a greater or lesser degree.

Another very striking example of mimicry is that first made known by H. O. Forbes who met with it in Java and in Sumatra. In the first instance, he noticed a certain butterfly perched, as often happens, on a white patch of bird's excrement dropped on a leaf. Approaching cautiously, he closed finger and thumb over the wings of the insect, which seemed glued to the sticky substance; «To my surprise, however,» Forbes relates, «part of the body remained behind, adhering, as I thought, to the excreta. . . . I looked closely at, and finally touched with the tip of my finger, the excreta to find if it were glutinous. To my delighted astonishment I found that my eyes had been most perfectly deceived, and that the excreta was a most artfully colored spider lying on its back, with its feet crossed over and closely adpressed to its body.» Forbes made the same mistake a second time, some months later in Sumatra; and speaks of this extraordinary spider as «a living bait so artfully contrived as to deceive a pair of human eyes even intently examining it.» Consult for the examples mentioned above Wallace, A. R., 'Malay Archipelago' (New York 1869); Forbes, 'A Naturalist's Wanderings' (New York 1885).

Ernest Ingersoll.

MIMIR, mē'mĭr, in Scandinavian mythology, the god of wisdom, and most celebrated of the giants. «Mimir's Well» was the fountain of all wit and wisdom, in whose depths the future was clearly mirrored.

MIMNERMUS, the earliest writer of Greek erotic elegy, was born in Colophon or Smyrna, and lived in the last half of the 7th century B.C. His collection of love-poems, called ‹Nanno› from the name of a flute-player whom in his old age he courted in vain, survives only in fragments which may be read in a separate edition by N. Bach (Leipzig 1826) or in Bergk's ‹Poetæ Lyrici Græci.›

MIMOSA, a genus of herbs, shrubs, trees and a few climbing species of the natural order *Leguminosæ*. The species, of which more than 200 have been discribed, are natives principally of the American tropics. They have pinnate leaves, usually spicate clusters of small flowers, followed by flat, oblong or linear pods which when ripe break into one-seeded joints. Many of the species are noted for their sensitive leaves which at nightfall close and droop Others respond to a touch. Of these the humble or sensitive plant (*M. pudica*) is perhaps the best known.

MIN. Egyptian god of agriculture, typifying the generative forces of nature. Annual harvest festivals were held in his honor. He is represented as a human being with a headdress of two enormous feathers and in his right hand he holds a flail. Behind him is a shrine with trees. The ram is sacred to him. Min was the local god of Panopolis or Akhmin and of Koptos. In later times Min was identified with Ammon Ra. The Greeks identified him with Pan. Consult Budge, A. Wallis, ‹The Gods of the Egyptians› (London 1904); Wiedemann, ‹Religion of the Ancient Egyptians› (New York 1897); Erman, A., ‹Life in Ancient Egypt› (London 1894).

MINA, Francisco Espoz y, Spanish guerrillero leader and general: b. Ydozin, Navarra, Spain, 17 June 1781; d. Barcelona, 24 Dec. 1836. As he sprang from the yeomen class, he naturally espoused radical and democratic ideas at an early age. When Napoleon tried to seize Spain, in 1808, Mina enlisted in Doyle's regiment and then passed into a band of guerrilleros commanded by his nephew, Xavier Mina. When Xavier was captured by the French in 1810, seven men of the band decided to follow Mina; and soon afterward the Junta of Aragon gave him command of all the guerrilleros of Navarra. The national government of Cadiz gave him rank and in 1812 he was promoted commander-in-chief in Upper Aragon and on the left bank of the Ebro. Mina was an excellent organizer and strategist. His position made it possible for him to confiscate war supplies imported by the French and to levy duty upon all imported war materials. This provided him with money to pay his troops regularly; and he was, therefore, able to maintain an excellent morale among his men and to please the countryside by avoiding a levy of taxes and contributions. Mina served with distinction under the Duke of Wellington in the campaign of 1813–14 and was frequently wounded. When Ferdinand VII was restored, he fell from favor, made an unsuccessful attempt to instigate an uprising among the Liberals at Pampluna and went into exile. The Revolution of 1820 brought him back and he served the Liberal party throughout northern Spain, resisting the French attempts to bring back the king. He was forced by the French to capitulate in November 1823, and the French allowed him to escape into England. In 1830 he made another attempt against Ferdinand; but notwithstanding this, on the death of Ferdinand he was recalled to Spain and the government of the regent, Cristina, gave him the command against the Carlists, in 1835, although fearing his Radicalism. By this time his health was broken and he resigned his command in April 1835. A year later he took command in Catalonia and aided in forcing the regent to grant a constitution to Spain (August 1836). Mina was a brave man. Mention is made of him in all the histories dealing with Spanish matters in the early days of the 19th century. He was a master in the practice of irregular mountain warfare and was not averse to high-handed methods. His first act was to arrest and shoot a brigand who was pretending to be a patriotic guerrillero. He made large claims; for instance that in two years (1810–12) he had fought 143 actions, taken 13 fortified posts and captured 14,000 prisoners. He also said that he immobilized 26,000 French troops which would otherwise have served with Marmont in the Salamanca campaign. In 1825 he published ‹A Short Extract from the Life of General Mina.› Consult his ‹Memorias,› published by his widow (Madrid 1851–52).

MINA, Francisco Xavier, Spanish solder: b. Ydozin, Navarra, 1789; d. Mexico, 11 Nov. 1817, nephew of Francisco Espoz y Mina (q.v.), with whom he served in the guerrilla warfare against the French in 1808–10. Taken prisoner, he was detained four years in Vincennes. In 1814 he served against Ferdinand VII, and fled to France and thence to England. While in England he became interested in the cause of Mexican patriots, and, aided by some wealthy Englishmen, he organized an expedition. Arriving in the United States he received support. Two hundred volunteers followed him to Galveston in November 1816. More assistance came from New Orleans. His force landed at Soto Marina, province of Tamaulipas, in April 1817. With his 300 men he took the towns of León and Guanajuato with the fortress of Sombrero and defeated the generals Armiñán and Ordóñez; but he was deserted by his followers, surprised by an overwhelming force and taken to Mexico, where he was shot.

MINA, an ancient Greek denomination of money. The Attic mina contained 100 drachmæ, and was valued at about $16.

MINA-BIRD, or **MYNA**, a starling or grakle (*Eulabes religiosa*), very familiar throughout India and eastward, nestling confidingly in gardens. Its color is a deep velvety black with purple and green reflexions, and with a white mark on the base of the quills of the wing. The bill and feet are yellow, and there are two yellow wattles on the back of the head. The Hindus regard it as sacred to Ram Deo. Certain other similar species are also called mynas in some localities.

MINÆANS. See SABÆANS.

MINAHASSAS, a medley of Malayan tribes of more or less savage type living in the province of Minahassa in northern Celebes. By some authorities this group of natives is called Alfuros, meaning wild, or half-savage. In language the Minahassas seem to belong to the Malay stock, but physically they resemble the Tagals and other Philippine tribes. Some of them have a suggestion of Japanese characteristics. They are supposed to have immigrated from the north into the island. The word *Minahassa* means «a country that has been formed by binding a number of territories into one.» The original form was Nimahasa. The chief town is Manado, or Menado, pleasantly situated on the shores of a wide open bay of the same name. The population of Manado consists of a very small percentage of white Europeans, a number of half-castes comprising Chinese, Eurasians, Arabs, Christians, a few Mohammedan natives and the Bantiks, a race of Alfuros that still retains its old religion. The population of Manado is between 5,000 and 6,000. The exports are copra, coffee, cocoa, vanilla, rattan, spices (chiefly nutmeg) and ebony and other wood. After the arrival of the Dutch colonists, wars, assassinations and revolting savage customs disappeared and the people are now peaceful, industrious and law-abiding. The change from a strict matriarchy to a strict patriarchy has, in many instances, taken place by the introduction of capture marriages. The change may be seen in operation in some of the Malay tribes at the present day. For a complete account of the history, manners and customs, mythology and industries of the Minahassas, consult Hickson, Sydney J., ‹A Naturalist in North Celebes› (1889).

MINAMOTO YORITOMO, Japanese warrior and statesman and one of the most famous figures in Japanese history: b. 1146; d. 1199. The chief clans in Japan in the middle of the 12th century were the Taira and their rivals, the Minamoto. The Mikados, like the Valois kings of France in the wars of the Huguenots and Catholics, vainly tried to balance one party against the other. In 1159 the Taira clan crushed the Minamoto clan and one of the Minamoto chieftains, Yoshitomo, was killed. Four of his sons escaped; two of them, Yoritomo and his younger brother, Yoshitsune, were destined to overthrow the Taira and to subjugate the three islands, Honshiu, Shikoku and Kiushiu. When Yoshitomo was treacherously murdered by Kiyomori, chief of the Taira clan, Yoritomo fled. Captured and brought before Kiyomori he was ordered o be beheaded; but, at the request of Kiyomori's stepmother, he was spared. He was banished instead to Idzu. While there, he married the daughter of Hojo Tokimasa, one of his guardians in exile. In 1180 he gathered an army made up of his father's scattered retainers, followers of his father-in-law and some monks of Hiyeizan,— a force of 27,000 men. He occupied the north bank of the Fuji River; and across the river was the Taira army nearly double the size. A decisive battle was about to be fought when suddenly the Taira army was seized with panic and retreated westward toward Kioto. At this moment Yoritomo was joined by his younger brother, Yoshitsune (1158–89), a graceful, well-knit youth, and, notwithstanding his early age, the best swordsman in Japan. Yoshitsune became lieutenant of his brother, Yoritomo, and marched out of Kioto 19 March 1184 with 75,000 men, most of them bodies of mounted archers. On 21 March Yoshitsune, while the Taira troops were engaged on both flanks, with a detachment of cavalry of the Minamoto army threaded his way across the mountains and riding down the steep declivity charged the enemy's centre. Both the Taira wings were crushed and the battle of Ichi-No-Tani was won. The victory of Ichi-No-Tani did not end the war, however, for the Taira fleet was intact. Yoritomo preferred to attack it; and the great sea-fight of Dan-No Ura took place on 25 April near the Straits of Shimonoseki. Yoshitsune was in command and had 800 junks as against 500 junks. Yoshitsune was victorious. The island of Kiushiu, like that of Shikoku and most of Honshiu, fell under control of the Minamoto leaders. Yoshitsune returned to Kioto with the reputation of being the foremost soldier and sailor in Japan. His success excited the jealousy of Yoritomo, who tried to have him assassinated. Yoshitsune, however, escaped with 11 comrades and raised a rebellion against his brother, which was unsuccessful. Finally Yoshitsune was murdered by a great noble named Mutsu.

Yoritomo now made Kamakura his capital and instituted many reforms, both civil and military. He became Shogun in 1192 and his methods for ensuring that the executive power should remain in his own hands and in those of his successors were remarkable. With the establishment of the Shogunate a new epoch in Japanese history began; and, with only a few breaks, it remained the prevailing form of government until the 19th century when Japan came into relation with the modern world. The foundation of the Shogunate must not be regarded, however, as the work of one man; it was the result of a long evolution of the feudal system which had its beginnings in the time of the Fujiwara.

Like Napoleon Yoritomo was a short set man with a large head. His voice was powerful and ringing; when he pleased his manners were extraordinarily gentle. Brave, astute and iron-willed, he is one of the most noteworthy of all Japanese characters. Of a cold, calculating nature, he knew how to use men and women as his tools and he stopped at nothing, not even at fratricide, to achieve his ends. In religious matters he proved a tolerant ruler. Among the monuments still extant at Kamakura are the temple of Hachiman, the god of war and tutelary deity of the Minamoto clan, and the temple of Kwannon, both of which he erected. The institutions founded by Yoritomo and modified by Tokugawa Iyeyasu at the beginning of the 17th century lasted until 1868. The Minamoto were in time superseded by the Hojo clan into which Yoritomo had married. On the death of Yoritomo, his son became Shogun, but his grandfather, Hojo Tokimasa, had him murdered after he had reigned four years. His brother, the third Shogun, succumbed to a plot by Hojo Yoshitoki and the Hojo clan ultimately obtained possession of the Shogunate. A portrait of Minamoto Yoritomo and also a battle of the Minamoto and Taira appear in Saito, Hisho, ‹A History of Japan,› translated by Elizabeth Lee (1912).

MINARET (Arabic, *minarat,* a lantern), a tower generally surrounded with balconies, and erected in connection with the mosques in Mohammedan countries, and peculiar to Mohammedan architecture from which the muezzin summons the people to prayer and announces the hours, bells not being used by the Moslems. The form is derived from the Pharos lighthouse at Alexandria. The earliest mosques had no minarets, the first known being that of Damascus, erected about 705. They are a square construction up to the height of the wall of the mosque, with a winding stairway, and above they are octangular. The tower of the Madison Gardens in New York is copied from the Giralda of Seville, which is 308 feet high. See MOSQUE.

MINAS, mē'näs, or **BELLO HORIZONTE,** Brazil, the capital of the state of Minas Geraes, stands at an elevation of over 3,000 feet, 60 miles northwest by rail of Ouro Preto, which it replaced as the administrative seat in 1894. It is a modern town with wide streets, electrically lighted, and adorned with handsome public buildings, elegant residences and fine parks. Pop. 14,000.

MINAS, Uruguay, the capital of the department of Minas, 56 miles by rail northeast of Montevideo. It carries on a trade in the produce of the surrounding agricultural region, and in the marble and granite of the neighboring quarries. Pop. 8,955.

MINAS GERAES, mē'näs zhä'rĭs, Brazil, a southeastern state bounded north by Bahia, east by Bahia and Espirito Santo, south by Rio de Janeiro and São Paulo, southwest by São Paulo, and west by Goyaz; area, estimated at 221,951 square miles. The surface is mostly mountainous, and though lying within the tropics its general elevation, averaging about 2,000 feet, renders the climate temperate and healthful; but the low tracts are periodically flooded, and contain extensive swamps and pools. It is rich in minerals, gold and diamonds being at one time a great source of wealth; silver, platina, copper, lead, rubies and other precious stones being found. Extensive iron-works have been erected in the neighborhood of Ouro Preto. Sugarcane, cotton, millet, tobacco and coffee are cultivated. The cultivation of cereals is extensive, and the finest European fruits have been introduced. Vast herds of cattle and swine feed in the pastures and forests. Timber and dye-woods of the most valuable kind, together with numerous varieties of gums, balsams and medicinal plants, grow freely in the latter. Some trade in home manufactures, and an extensive foreign commerce, have been established. For administrative purposes Minas Geraes is divided into 14 comarcas. It sends 20 members to the general assembly and 10 to the senate. The provinicial assembly is composed of 36 members. It sits at Minas (q.v.) since 1894, when the administrative seat was removed from Ouro Preto. Pop. 4,649,825.

MINAS DE RIO TINTO, Spain, town in the province of Huelva, 32 miles northeast of the city of Huelva. The mountainous country in which this town is situated contains rich deposits of copper ore which were worked by the ancient Phœnicians. In 1873 a London company took control of these mines and produced the ore by new methods. More than 10,000 workers are now employed. In 1911 the ore produced amounted to 1,603,854 tons. In 1845 the town had only 800 inhabitants: in 1910, 12,626.

MINBU. A district and division of Upper Burma. This district consists of 3,299 square miles with a population of 233,377. The physical features exhibit low plain land toward the Irrawaddy, and an undulating country inland, rising ever higher westward toward the Arakan hills. Between the plain and the Arakans run the Nwa-Madung hills, north and south. The chief rivers and streams are the Irrawaddy, the Môn, the Maw and the Salin. They are much used for irrigation. Along the Irrawaddy and in the lagoon fed by it, called Paughlin Lake, there are fisheries, the rights to which are sold yearly by public auction, and realize an average of $5,000. The valleys are cultivated, but are deadly except to natives. Oil has been discovered near the mud volcanoes of Minbu, but lie too deep to be profitably worked. Along the Môn River the betel-vine is cultivated. The district of Minbu contains much forest land. The chief crops are rice, millet, grain, beans, peas, sesamun and tobacco. The annual rainfall varies everywhere. In the hot months the thermometer rises to 100° F., and in December it falls to 49° F. The chief town is also called Minbu. It is situated on the Irrawaddy, which is here three miles wide with many islands and sandbanks. Pop. about 5,780. In the dry season the steamers cannot come nearer to the town than two miles. The division of Minbu consists of the districts of Minbu, Magwe, Thayetmyo and Pakôkku. Its area is 17,172 square miles. Pop. about 1,076,280.

MINCH, The, Scotland, the channel off the northwest coast between the mainland and the northern part of the Outer Hebrides; it is from 25 to 45 miles wide and has a very rapid current, and on either side are numerous lochs or sea-arms penetrating inland. It is connected with the Sea of the Hebrides on the south by the Little Minch, the channel between the island of Skye and Long Island; it is from 14 to 20 miles wide.

MINCIO, mĭn'chō, Italy, a river, the ancient Mincius, which flows from the south extremity of Lake Garda, near Pescheria, and after forming the lake and marshes that surround Mantua falls into the Po eight miles below the city. Its banks are remarkably fertile, and celebrated for their beauty by Virgil, who was a native of this country. It formed an important base of operations in the wars between France and Austria. The length of its course is about 115 miles.

MINCOPIES, min-kō-piz, natives of the Andaman Islands. They are typical Negritos, averaging less than five feet in height with cephalic characteristics similar to those of the negro. Their condition is low. They live in open huts (called chongs), consisting of a roof on four stakes, and subsist on roots, wild fruit and game. In hunting they use a peculiar S-shaped bow. There are 12 tribes of Mincopies, all descended from a common stock but each with its own dialect and tribal habits. Consult Deniker, ‹Races of Man› (1901); Brown, A. R., ‹Notes on the Language of the Andaman Islands› (1914) and ‹Aborigines of the Andaman Islands› in the *Journal of the Anthropological Society* (Vol. XI, London 1882).

MIND. See PSYCHOLOGY.

MIND-CURE. See MENTAL SCIENCE; SUGGESTION.

MIND READING. See Hypnotism; Telepathy.

MIND-STUFF. See Panpsychism.

MINDANAO, mēn-dä-now′, Philippines, the most southeastern and second largest island of the archipelago, lying between lat. 5° 35′ and 9° 50′ N. and between long. 121° 53′ and 126° 28′ E., about 220 miles northeast of Borneo. It is bounded on the east by the Pacific Ocean and on the west by the Sulu Sea; area, 35,457 square miles; with its dependent island, 36,293 square miles.

Topography and Climate.— The outline of the island is very irregular and the coast is uneven and much indented with deep bays and inlets; the shore line is 1,592 miles and the width of the island from east to west 386 miles. The island is very mountainous, particularly in the interior, the mountain system consisting of a number of irregular ranges extending generally north and south, and as a rule approaching near the coast. The mountain formation shows the effect of earthquake and volcanic action, and there are many volcanoes, some of which are active. The principal peaks are Apo (10,312 feet), near the southeastern coast, and Malindang (8,560 feet) in the northwest. The island is drained chiefly by two large rivers, both over 200 miles long, the Grande de Mindanao (q.v.), flowing southwest and west, on the western side of the central mountain range, and the Butuán or Agusán, flowing northwest, on the eastern side of the same range. There are numerous other small streams and nine large mountain lakes. There are iron springs at Placer, in the province of Surigao; sulphur springs at Mainit, Surigao and Balingasag, Misamis, and medicinal thermal springs at Malibato. As the island is within 10° of the equator, the climate is hot and humid, but more equable than that of Luzon; rains are frequent and heavy, the annual fall being 100 inches.

Forests and Fauna.— The island is covered with forests of valuable woods for ship and house-building and furniture making; among these are the molave narra (similar to the yellow pine), teak, ebony and cypress; the gum and resin-producing trees and medicinal and dye plants also grow abundantly. Animal life is abundant in these forests; over 200 species of birds have been classified, of which 17 species are peculiar to Mindanao and Basilan; deer, wild hogs, monkeys and the haguang or colugo (q.v.) are numerous. Reptiles, including the giant lizard, iguana and large snakes, particularly the boa, also infest the forests and crocodiles the river.

Industrial Resources.— The staple, agricultural products are rice, sugar, cotton, corn, tobacco, indigo, coffee and hemp; other products of special value are cloves, nutmegs, cinnamon and other spices, betel nuts and betel peppers. The most important industry is the cultivation and shipment of hemp and forest products; large herds of cattle and horses are raised; and there is a little weaving of hemp and cotton fabrics for home use. Less than 2 per cent of the land is under cultivation. Edible birds' nests are also gathered and exported. Communication is largely by water, as there are few roads except in the immediate vicinity of the chief towns, and the towns and villages are situated on the coast or on the large lakes and rivers. Gold is obtained in small quantities by the natives, and is doubtless abundant; coal, sulphur, copper and platinum are also reported.

People and Government.— About a third of the population of Mindanao is composed of Christianized Malays; there are also tribes of the Moro race who are Mohammedan in religion; the interior is peopled by pagan tribes and the northern and eastern coasts by Visayan Filipinos. The island was first occupied by United States troops in 1899. Civil government was provided for Mindanao and adjacent islands under the Philippine Commission in 1903, under the name of the Moro Province. In 1914 the department of Mindanao and Sulu was created, the military governor of the old Moro province giving place to a civil governor invested with wide powers and whose constructive task it will be to bring a turbulent and suspicious Mohammedan population into harmonious relations with the Christian Filipinos. There was a serious outbreak of cholera in 1915. Pop. 499,634. See Philippine Islands; Moros.

MINDANAO, Grande de, grän′dā dā mēn-dä-now′, a large river of the island of Mindanao, Philippines. It rises in the Rangayán Mountains, flows south to the Lake of Liguasan, and passing through this lake flows northwest to Illana Bay. About 25 miles from its mouth it divides into two branches, which enter the bay about five miles apart, with a large delta between them; the north arm is the larger and more navigable; the south arm is narrow and only five feet in depth. The river is navigable for 70 miles for small vessels not drawing over four feet. Its course is mostly through a very fertile region and it drains an extensive plain with several large lakes; in length and volume it is the largest river of the Philippines. In the upper part of its course it is known also as the Pulangui.

MINDEN, Neb., city and county-seat of Kearney County, on the Chicago, Burlington and Quincy Railroad, about 120 miles west by south of Lincoln. It is in a fertile agricultural region in which stock-raising is also a prominent industry. It has considerable trade in wheat, corn, hay and livestock. There are one State and two national banks, courthouse and an excellent high-school building. Pop. 1,600.

MINDEN, Prussia, a town of Westphalia, on the left bank of the Weser, 35 miles southwest of Hanover. It is one of the oldest towns in Germany and the streets in the ancient parts are narrow and crooked. It has a fine cathedral of the 13th century, in the early pointed Gothic style, a gymnasium and an orphan hospital; manufactures of linen and cotton, tobacco, chicory, chemicals, soap, lamps, machinery, etc., and an important transit and general trade. It was made the seat of a bishopric by Charlemagne, was afterward a member of the Hanseatic League, became a possession of the Elector of Hanover and finally passed into the possession of Prussia in 1814. On 1 Aug. 1759 the French were defeated here by an Anglo-Hanoverian army during the Seven Years' War. Pop. 26,454, predominantly Protestant.

MINDORO, mēn-dō'rō, Philippines, an island lying south of Luzon, a little north of the centre of the archipelago; length, northwest to southeast, 110 miles; width, northeast to southwest, 56 miles; area, 3,851 square miles, with dependent islands, 4,024. The island, which is oval in outline, is mountainous, the general topographical features consisting of several high broken ranges, forming an elevated plain in the interior; and from this plain sierras extend in different directions toward the coast, which is mostly low and marshy, especially on the north and east; on the west coast along Mindoro Strait is prairie land. The culminating point of the mountain system is Halcón Mountain in the north (8,800 feet). There are numerous small rivers, but no general river system of main stream and tributaries. The climate is variable; the rainfall heavy and monsoons frequent; the western coast is temperate and healthful, but the northern and eastern coasts are hot.

At one time, before the decay of the Spanish monarchy, the rice yield was so abundant that Mindoro was called «the granary of the Philippines»; but the frequent attacks of Moro pirates destroyed the prosperity of the island, and the agricultural products are now unimportant, being almost entirely for home consumption. Sugarcane is being profitably exploited; rice, cocoa, tobacco, hemp, cotton, etc., are raised; the cultivation of hemp is increasing and a small amount of cotton is exported to the island of Ipil. In the time of the early Spanish explorers reports of great mineral wealth, especially gold, were circulated; the real mineral resources are but little known, though as far as modern exploration has gone copper, gold and coal have been found. The island is heavily wooded and its chief commercial wealth is in forest products; the trees include cedar, ebony, mahogany, gum trees, gutta-percha, palms and dye woods. Near the principal towns wood-cutting and rattan splitting for the Manila market is the chief industry; rattan, buri, honey, forest gums, balao oil, pitch and other forest products are the chief articles of export; tortoise-shell, obtained from the small neighboring islands, and canoes cut from a single piece of wood are also exported; and there is a considerable production of sago. There are only a few roads, access to inland villages being by mountain trails or by river-canoes; the local trade between coast towns is carried on mostly by native sailing craft; all exports for Manila and other islands are concentrated at ports of call for steamers.

In June 1902 civil government was extended to Mindoro and adjacent islands, and it was detached from the province of Cavité and made a subprovince of Marinduque (q.v.). The inhabitants of the interior are wild tribes, among whom the Manguianes (about 15,000 in number) predominate; the people of the north coast are mostly Tagálogs, those of the south coast Visayans. Pop., estimated to include wild tribes of the interior, 28,361.

MINE ACCIDENTS. The conservation of human life in mining and other industrial plants is of such importance that it has resulted in the enactment of inspection laws, the purpose of which is to safeguard the workmen. The first coal mine-inspection law was enacted in Pennsylvania in 1870,* and since then the other States have done likewise until all the important coal-producing States are under State inspection.

The United States has produced 11,093,500,000 tons of coal under inspection since the first State-mine inspection law was enacted. The complete records for this production to the close of 1917 show that 59,269 men have been killed in coal-mine accidents while in the performance of their regular duties of mining coal. The number of men engaged in the production of this amount of coal represents the equivalent of an army of 18,078,000 men engaged for one year. The number of men killed per 1,000 employed during this 48-year period was 3.28. For every 10,000,000 tons of coal produced 55 lives were lost, or a production of 186,700 tons for each life.

At the beginning of the inspection service, the fatality rate was 5.92 per 1,000 men employed, or a production of 74,238 tons of coal per fatality. In both 1915 and 1916, the fatality rate was 3.09 per 1,000 men employed, while in 1917, owing to war conditions, the fatality rate was 3.56 per 1,000 men employed. The largest production per fatality was in 1916 when 265,094 tons of coal were mined for each man killed during the year.

Records of non-fatal accidents at coal mines are incomplete, but with the enactment of compensation laws since 1911, data relating to these are being collected, but it has not been assembled sufficiently to give a total for the United States for any particular year. However, it is believed they will be comparable with the figures for the metal mines.

Inspection in metal-mining States has not been as complete as in the coal-mining States. However, in 1911 the United States Bureau of Mines began a systematic census of metal mines and quarries, resulting in representative data. Complete returns are not possible, by reason of the law not making it compulsory to report to the bureau. Sufficient data have been obtained, however, to indicate that the non-fatal accident rate in metal mines is more than 300 per year per 1,000 men employed. It is believed that this rate will also apply to coal mines. The quarry rate is less, about 125 per 1,000, as all work is performed in the open daylight conditions.

Table 1 shows that for the mines, quarries and metallurgical works of the United States more than 1,000,000 men are employed, of whom three out of every 1,000 are killed each year. At least 300 per 1,000 in the combined industries are injured to the extent that valuable time is lost, and in most cases medical attendance required. A reduction of 50 per cent in the number of accidents would mean an annual saving of 1,500 lives, to say nothing of lessening the injuries and sufferings sustained by about 300,000 workmen. From an humanitarian point of view, a great good would be accomplished if this reduction could be brought about. Accidents will occur, yet experience shows that they may be reduced in number, although it is impossible to eliminate them entirely.

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*For details of coal-mine fatalities, 1870-1914, the reader is referred to U. S. Bu. Mines Bull. 115, coal-mine fatalities in the United States, 1870-1914, by A. H. Fay.

The accompanying tables point out some of the principal causes of accidents and furnish enough basic information to call attention to the importance of accident prevention.

As a summary of what may be done to assist in accident reduction, the following is submitted:

1. Keep exact records of all accidents as to time, place, cause and result of accident along the line of the report required by the insurance companies before a claim is paid.
2. Keep detailed records of men employed, days worked, as well as shifts and wages lost by reason of accidents. This will bring out the economic loss due to accidents.
3. Standardization of mining laws, rules and regulations so that all companies will be required to render to the State mine inspector, or compensation commission, the same type of report.
4. Co-operation with State and Federal agencies, whose objects are a reduction of accidents, the welfare of the workman and the installation of safety devices.
5. The spread of safety-first propaganda as much as possible in any manner whatever whereby an interest may be created among the employees, and thus educate them to be able to take care of themselves.
6. The installation of safety devices; systematic inspection, and above all the education of employer and employee as to the needs of results to be obtained from accident-prevention work.

Fatalities in the Mining Industry Due to Explosives.— Table 4 shows the number of fatalities from the use of explosives in the bituminous coal mining industry and Table 5 shows the number and percentage of fatalities at metal mines and quarries due to explosives. In 1903 (Table 4) 9.8 per cent of the fatalities at bituminous mines were due to the use of explosives, whereas in 1917 only 2.65 per cent

TABLE 1.—FATALITY RATES IN DIFFERENT BRANCHES OF MINERAL INDUSTRIES IN 1917 COMPARED ON A 300-DAY BASIS.

(Length of shift not considered.)

BRANCH OF MINERAL INDUSTRY	Average days active	Men employed		Days of labor performed	Killed	Number killed per 1,000 employed	
		Actual number	Equivalent in 300-day workers (calculated)			On actual time basis	On 300-day basis
Metal mines	287	200,579	192,085	57,625,811	852	4.25	4.44
Metallurgical workers:							
Ore-dressing plants	303	24,111	24,372	7,311,499	47	1.95	1.93
Smelters *	342	44,376	50,659	15,197,643	53	1.19	1.05
Auxiliary works	328	15,555	17,014	5,104,146	16	1.03	.94
Coal mines	251	757,317	634,666	190,399,680	2,696	3.56	4.25
Coke ovens:							
Beehive	308	18,820	19,295	5,788,576	25	1.32	1.30
By-product	360	13,597	16,300	4,889,853	51	3.75	3.13
Quarries (inside)	249	54,804	45,449	13,634,773	91	1.66	2.00
Quarries (outside)	285	27,486	26,076	7,822,584	40	1.46	1.53
Total, 1917	266	1,156,645	1,025,916	307,774,565	3,871	3.35	3.77
Total, 1916	255	1,128,257	957,393	287,218,232	3,224	2.86	3.37

* Does not include iron and steel industry.

TABLE 2.—NON-FATAL INJURIES IN THE METAL MINING INDUSTRY OF THE UNITED STATES, BY MINING METHODS.*

METHOD OF MINING	1915		1916		1917	
	Number of injuries	Number injured per 1,000 300-day workers	Number of injuries	Number injured per 1,000 300-day workers	Number of injuries	Number injured per 1,000 300-day workers
Room and pillar	2,819	413.95	4,013	477.17	2,953	290.68
Overhand stoping	15,668	382.72	13,198	436.44	13,066	358.23
Underhand stoping	976	507.81	1,707	460.11	1,380	297.99
Caving methods	5,801	328.13	7,134	349.71	6,545	329.94
Open pit, with steam shovel	1,908	250.97	2,416	281.58	2,287	221.39
Open pit, without steam shovel	142	120.03	108	348.39	109	86.71
Total and average	27,314	358.73	28,576	398.83	26,340	318.52

* The data shown here represents 75,000 300-day workers, or three-eighths of the entire metal mining industry for each of the three years.

TABLE 3.—METAL MINES, COAL MINES, AND QUARRIES: PRINCIPAL CAUSES OF FATALITIES, SHOWING PERCENTAGE DUE TO EACH CAUSE, 1911 TO 1917, BY YEARS.*

INDUSTRY	Cause of death								Total
	Falls of overburden, roof, quarry material, ore, or coal	Explosives	Haulage and handling rock, ore, or coal	Falls of person	Electricity	Machinery	Gas and dust explosions	Other causes	
1911:									
Metal mines	35.52	11.22	7.63	15.39	2.45	3.16	......	27.63	100.00
Coal mines	47.40	6.02	17.13	1.28	3.73	1.51	13.74	9.19	100.00
Quarries	25.53	26.60	20.21	8.51	1.07	9.04	......	9.04	100.00
1912:									
Metal mines	34.49	14.22	10.28	13.92	3.78	3.78	......	19.52	100.00
Coal mines	49.03	6.08	19.14	1.36	3.64	1.65	11.99	7.11	100.00
Quarries	17.37	22.06	27.70	8.92	1.87	11.74	......	10.33	100.00
1913:									
Metal mines	34.70	13.03	12.88	12.30	3.81	4.39	......	18.89	100.00
Coal mines	45.39	4.95	18.31	1.80	3.16	1.80	18.45	6.14	100.00
Quarries	14.75	24.04	23.50	9.29	2.73	12.57	......	13.12	100.00
1914:									
Metal mines	36.32	10.73	10.20	16.10	3.04	2.50	......	21.11	100.00
Coal mines	46.09	5.95	18.79	2.85	4.07	1.87	14.22	6.16	100.00
Quarries	29.45	19.44	18.33	12.78	1.67	6.11	......	12.22	100.00
1915:									
Metal mines	36.71	14.10	10.49	15.91	2.53	1.99	......	18.26	100.00
Coal mines	47.55	6.83	18.64	1.37	4.36	1.68	13.40	6.17	100.00
Quarries	30.40	18.92	15.55	11.48	2.03	9.46	......	12.16	100.00
1916:									
Metal mines	32.28	12.77	10.04	14.64	3.73	2.58	......	23.96	100.00
Coal mines	47.84	6.56	20.89	1.39	4.36	1.89	10.15	6.92	100.00
Quarries	19.08	16.18	19.66	8.09	4.05	16.76	......	16.18	100.00
1917:									
Metal mines	26.17	9.27	10.33	13.15	2.23	2.00	......	36.85	100.00
Coal mines	45.18	4.12	22.11	.96	3.52	2.34	13.43	8.34	100.00
Quarries	18.32	16.03	24.43	11.45	1.52	15.27	......	12.98	100.00

* Fay, Albert H., " Metal-mine accidents in the United States," 1917; Tech. Paper 224, Bureau of Mines, 1919.

were due to this cause, owing to the introduction of permissible explosives.

Table 5 shows that from 11 to 14 per cent of the metal-mine fatalities and 16 to 26 per cent of the quarry fatalities are due to explosives, whereas in Table 4 for the same years the percentage in bituminous coal mines was 3.68 to 2.65 in 1917.

TABLE 4.—FATALITIES DUE TO EXPLOSIVES AT BITUMINOUS COAL MINES, 1903–17.

YEAR	Number killed	Percentage of total killed	Number killed per 1,000 employed
1903	138	9.80	0.339
1904	121	8.64	.290
1905	119	7.49	.264
1906	115	7.27	.246
1907	134	5.29	.264
1908	109	6.17	.216
1909	122	5.88	.244
1910	113	5.09	.203
1911	72	3.68	.130
1912	70	3.85	.128
1913	63	2.91	.110
1914	56	3.01	.096
1915	76	4.52	.136
1916	60	3.59	.106
1917	56	2.65	.092
1918	85	4.19	....

TABLE 5.—NUMBER AND PERCENTAGE OF FATALITIES DUE TO EXPLOSIVES, AT METAL MINES AND QUARRIES IN THE UNITED STATES.

YEAR	Metal mines		Quarries	
	Number	*Per cent*	*Number*	*Per cent*
1911	78	11.22	50	26.60
1912	94	14.22	47	22.06
1913	89	13.03	44	24.04
1914	60	10.73	35	19.44
1915	78	14.10	28	18.92
1916	89	12.77	28	16.18
1917	79	9.27	21	16.03

Principal Coal-Mine Disasters.— Table 6 on the following page gives what is believed to be a complete list of those coal-mine disasters in the United States in which 100 or more men were killed.

Bibliography.— Fay, A. H., 'Coal-mine Fatalities in the United States, 1870–1914,' with statistics of coal production, labor and mining methods, by States and calendar years (Bull. 115, United States Bureau of Mines, Washington 1916); Willcox, F. H., 'Occupational Hazards at Blast-furnace Plants and Accident Prevention based on Records of Accidents at Blast furnaces in Pennsylvania in 1915' (Bull. 140, United States Bureau of Mines, ib. 1917);

TABLE 6.— COAL MINE DISASTERS IN WHICH 100 OR MORE WERE KILLED.*

DATE		Name of mine	Location of mine	Nature of accident	Killed
1869	Sept. 6	Avondale	Plymouth, Pa	Mine fire	179
1884	Mar. 13	Laurel	Pocohontas, Va	Mine explosion	112
1891	Jan. 27	Mammouth	Mount Pleasant, Va	Mine explosion	109
1892	Jan. 7	No. 11	Krebs, Okla	Mine explosion	100
1900	May 1	Winter quarters Nos. 1 and 4	Scofield, Utah	Mine explosion	200
1902	May 19	Fraterville	Coal Creek, Tenn	Mine explosion	184
1902	July 10	Rolling Mill	Johnstown, Pa	Mine explosion	112
1903	June 30	Hanna No. 1	Hanna, Wyo	Mine explosion and fire	169
1904	Jan. 25	Harwick	Cheswick, Pa	Mine explosion	179
1905	Feb. 20	Virginia City	Virginia City, Ala	Mine explosion	108
1907	Dec. 6	Monongah Nos. 6 and 8	Monongah, W. Va	Mine explosion	361
1907	Dec. 19	Darr	Jacobs Creek, Pa	Mine explosion	239
1908	Nov. 28	Rachel and Agnes	Marianna, Pa	Mine explosion	154
1909	Nov. 13	Saint Paul No. 2	Cherry, Ill	Mine fire	259
1911	Apr. 8	Banner	Littleton, Ala	Mine explosion	128
1913	Oct. 22	Stag Canon No. 2	Dawson, N. Mex	Mine explosion	263
1914	Apr. 28	Eccles Nos. 5 and 6	Eccles, W. Va	Mine explosion	181
1915	Mar. 2	Layland No. 3	Layland, W. Va	Mine explosion	112
1917	Apr. 27	Hastings	Hastings, Colo	Mine explosion	121

* Fay, Albert H., " Coal-mine Fatalities in the United States," 1917, U. S. Bureau of Mines, 1918.

Fay, A. H., 'Metal-mine Accidents in the United States' (Tech. paper 224, United States Bureau of Mines, ib. 1917); id., 'Coke-oven Accidents in the United States in 1916' (Tech. paper 173, United States Bureau of Mines, ib. 1917); id., 'Coal-mining Fatalities in the United States in 1916' (Washington 1917). Coal-mine fatalities in the United States, 1918, with tables supplemental to Bureau of Mines Bull. 115 (Washington 1919).

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MINE GAS, the same as fire-damp (q.v.).

MINE PLANTERS. The mine planter service in time of peace is organized for instruction purposes. In time of war the vessels of this service, together with such additional vessels as may be obtained for this duty by the War Department, are assigned to the various coast defenses for service in planting mines. The vessels for this service are known as United States army mine planters, and when not assigned to coast artillery districts, coast defenses or to the Coast Artillery School, are under the control of the quartermaster-general of the army.

Upon arrival in a coast-defense command for the purpose of carrying out the instructions of the War Department, the commanding officer of a mine planter reports by telegraph to the coast artillery district commander and in person to the coast-defense commander. He retains command of his vessel, but the planter becomes a part of the local submarine defense equipment of the coast-defense command. The planter is assigned, for instruction purposes, to the mine commands by the coast-defense commander. The latter exercises general supervision over the mining instruction, and is held responsible that full advantage is taken of the presence of the planter for instruction purposes. Except in case of emergency he does not use the mine planter, nor permit the use thereof, for any other purpose than for carrying out the instructions prescribed by the War Department.

Whenever a mine planter leaves one coast-defense command for another, or leaves for any locality outside the limits of a coast-defense command for repairs or for other purpose, the commanding officer of the planter telegraphs to the coast artillery district commander his time of departure, and on arriving at his destination his time of arrival thereat. During the time mine planters are beyond the limits of a coast-defense command they are under the direct control and supervision of coast artillery district commanders. At such times coast artillery district commanders have the same control over mine planters, as they have over other elements of the coast defenses, within the limits of their districts, respectively, subject to the requirements prescribed by the War Department.

Upon completion of the work in a coast-defense command, the commanding officer of the vessel submits a report covering (1) in general terms the work done during the presence of the mine planter; (2) a statement of any unusual difficulties encountered; (3) the condition of the entire mine equipment in the coast-defense command (including both structures and material) and (4) any important recommendations. This report is submitted in triplicate to the coast-defense commander. Communications relating to the crew's equipment and repairs are sent to the quartermaster-general of the army.

On the last day of each month the commanding officer of the vessel forwards to the adjutant-general of the army, through military channels, an extract from the logbook, showing the movements of the vessel during the month; any unusual incidents, collisions, groundings or other accidents; assistance rendered other vessels; dates of inspections and by whom; also the quantity of coal consumed, in pounds, and the number of miles run each day; with the total coal and water consumption, number of mines planted, number of mines taken up, miles of multiple cable laid, miles of multiple cable taken up and miles traveled during the month. The shipping laws recited in the official logbook of the Mercantile Marine of the Department of Commerce govern so far as they may be applicable to mine-planting boats and are not in conflict with army regulations and orders of the War Department.

When engaged in planting or taking up mines a lifeboat is kept in readiness for immediate launching. EDWARD S. FARROW,
Consulting Military and Civil Engineer.

MINE RUN, Campaign of. During the Civil War, on 7 and 8 Nov. 1863 General Meade crossed the Rappahannock at Kelley's Ford and Rappahannock Station, and concentrated his army of 70,000 men in the vicinity of Brandy Station, General Lee, with 50,000 men, withdrawing beyond the Rapidan to an entrenched line, the left of which covered some of the fords of the river, the right being perpendicular to it and extending to Bartlett's Mill on Mine Run. On 26 November Meade began the Mine Run campaign by sending the First, Fifth and Second corps to cross the Rapidan at Culpeper Mine and Germanna fords, and the Third and Sixth corps to cross at Jacob's Mill, all five corps to converge upon the old turnpike and the plank-road near Robertson's Tavern, both leading to Orange Court House, and turn the right of Lee's position. An early start was made on the 26th, but owing to delay in some of the columns, all were halted for the night but a short distance beyond the river. The march was resumed at daylight of the 27th. The Second corps reached Robertson's Tavern at 10 A.M., to find itself in the presence of a considerable body of Ewell's corps which Lee had hastened there, and it was ordered to remain on the defensive, until the Third corps, followed by the Sixth, came up on the right. But the Third corps was delayed. Lee, on discovering Meade's movement, had promptly ordered Early, commanding Ewell's corps, to move to the right. Part of his command had reached Robertson's Tavern and confronted the Second corps, and Johnson's division was moving in the same direction when it came into collision with the Third corps, on Payne's Farm, and a battle ensued, lasting until dark. Both sides claimed the advantage, but the engagement resulted in a delay to Meade's operations, and, as he claims, the failure of his campaign. The Union loss was 125 killed, 747 wounded and 71 missing. Lee reported a Confederate loss of 545. The Second corps was severely engaged during the day, and advanced some distance beyond Robertson's Tavern. At night the First corps moved up to the support of the Second. The Fifth corps, which had supported Gregg's cavalry division in an engagement at Parker's store, on the Orange plank-road, was brought over to support the Second, and next morning the Third and Sixth corps came up on the right of the Second. On the 28th Meade advanced to the attack, but on driving in the Confederate pickets it was found that Ewell's corps had fallen back. Pursuit was made, the Second corps in advance, and after a march of two miles Ewell was found in position on the west side of Mine Run. A. P. Hill had come up and formed on Ewell's right, covering the Orange plank-road. The line was very strong, and on it were 150 guns. It was after dark when the Second, Sixth and First corps, with part of the Third, fronted this position. An examination of Lee's position convinced Meade that there was no probability of success in an attack in his immediate front, and he determined to send General Warren, with his Second corps and a division of the Sixth, to feel for Lee's right flank and turn it if practicable. The 29th was spent in reconnoitring and demonstrations, while waiting for Warren's movement. Early in the morning of the 29th Warren started from Robertson's Tavern, crossed over to the plank-road, drove in the skirmishers of A. P. Hill's corps and late in the day came upon Hill's position across the road. Warren reported to Meade that the conditions were favorable for an attack, and personally assured him that he could carry everything before him. Meanwhile some of Sedgwick's division commanders had discovered weak points on Lee's left, no works being thrown up, and Meade ordered an attack for the morning of the 30th, the right and centre to open with artillery at 8 o'clock, at which time Warren was to make the main attack, and at 9 o'clock Sedgwick was to assault Lee's left with five divisions of the Fifth and Sixth corps. Two divisions of the Third corps were sent to Warren, thus increasing his command to six divisions of 26,000 men. The batteries on the right and centre opened a furious fire at 8 A.M. The skirmishers of the First and Third corps advanced across Mine Run and drove in those of the enemy, and Sedgwick was about to assault when Meade ordered him to desist. He had received a dispatch from Warren advising against an attack on Lee's right, as it could not succeed. During the night of the 29th Warren had made dispositions for an overwhelming assault, but on the morning of the 30th he saw on the heights before him a line of strong works thrown up over night, well filled with infantry, and heavy batteries covering the slope up which it was necessary to charge, and therefore he deemed successful attack impossible. Meade rode over to Warren, who proved unchangeable in opinion, and Meade tried to arrange for an attack later in the day, but found it impracticable. The armies remained confronting each other that day and the next, and on the night of 1 December Meade withdrew to his former position beyond the Rapidan. Lee followed part way on the 2d. The Union loss in the Mine Run campaign, 26 November to 2 December, was 173 killed, 1,099 wounded and 381 missing. The Confederate loss was 110 killed, 570 wounded and 65 missing. Consult 'Official Records' (Vol. XXIX); Humphreys, 'From Gettysburg to the Rapidan'; Pennypacker, 'Life of General Meade'; Wather, 'History of the Second Army Corps'; Powell, 'History of the Fifth Army Corps'; The Century Company's 'Battles and Leaders of the Civil War' (Vol. IV). E. A. CARMAN.

MINE SURVEYING. See SURVEYING.

MINE-SWEEPING. Almost immediately upon the development of the mine itself came the development of measures for combating of mines. From the very first the mine was used as a weapon of offense and it became necessary to find some means of protection against it. As early as 1777, Bushnell, an American inventor, devised moving machines which were discharged in the Delaware River against British ships. These were later ridiculed in a ballad called 'The Battle of The Kegs.' Later in the blockade of American harbors by the British in 1813, and in the Crimean War, nothing more useful seems to have been employed in the detection and destruction of mines than dragging for them with nets, etc.

During the American Civil War, however, mines began to be used on so large a scale and so effectively that it became necessary for the Northern States to adopt adequate measures for protection against them. The first idea was to creep for the cable connecting the torpedoes, in the hope that the creep would break the cable or explode the mines. Later, chains towed between two vessels were used in an attempt to seizze the moorings of the mines, the latter being then raised and rendered harmless. These methods do not appear to have met with any great measure of success.

In 1863, Ericsson constructed his mine-destroyer, which consisted mainly of a strong float attached to the forward part of the ship and extending well to the front of the bow. At the extreme front end of the float and several meters under the surface of the water was fixed an explosive charge of 700 pounds of powder. In front of the charge were rigged two timbers which, upon engaging an obstacle, closed upon each other as do the parts of a parallel ruler, thereby igniting the charge. The important feature of the invention was the air chamber placed directly in front of the charge. This gave way at the push of the explosion and allowed the full foce to be sent forward against the obstacle, thereby protecting the float itsself from any damage. A large number of these mine-catchers were produced at that time, but for some reason or other no further use was made of the invention.

Up to quite recent times nothing had been done toward the improvement of methods for the detection of mines. They had been used mostly as a weapon of defense for the protection of coastal localities and the blocking of channels, until the outbreak of the Russo-Japanese War. During this war, however, it became the custom to strew broadcast great numbers of unanchored mines, and it became necessary to find a means of searching out the location of these mines and destroying them.

The oldest method of protecting warships against mines was in the use of less valuable ships as exploders. One or more of these would go ahead of the battleships, in the hope of striking and exploding enough mines to make a breach in the minefield. The exploder had to be of draught at least equal to that of the ship to be protected, and also had to be so constructed that after the explosion of the first mine the engines would still drive it ahead to the destruction of others. To meet the latter requirement, the ship had to have its engines located aft, as in the case in tank steamers. Of course, the exploder was inevitably sacrificed, so that the method was a very expensive one. Other objections were that even a number of these ships might go through a field and miss mines that would sink the ships to be protected, and that success in the exploder's mission meant sure death to her crew.

Another contrivance for the discovery of and protection against mines is the mine-catcher. This is a very heavy and clumsy apparatus, consisting of steel frames or wooden balks fixed to the sides of the vessel, supported and stiffened below by wire hawsers. The mine-catcher is expected to break the moorings, causing the mine to rise to the surface, where it can be rendered harmless, or to overturn the mine, causing the explosive to be displaced. In any case, it is quite likely that the resulting explosion will damage the catcher, necessitating frequent repair. In order to be able to break a wire hawser, the mine-catcher has to be very strongly constructed. This results in a bulk and weight which greatly hinder the proper navigation of the ship and hold it down to a very slow pace. Counter-mines are often used although they are in reality not employed to seek out the location of mines, but rather to destroy a field which has already been located. They are joined up in a series and towed along on a wide front. When it is found that the counter-mines have engaged the enemy mines, the boats sheer off the necessary distance and the charges are exploded by electricity, the nearby enemy mines being thereby destroyed.

A many-fluked grapnel is often used to drag for the cables of such mines as are exploded from the shore. In some cases the fished-up cable fails to break, so that it is well to have an explosive charge in the grapnel, with an arrangement for detonating it from the vessel by which the grapnel is operated. During the American Civil War, search was made for mines with chains and hawsers. This is the method which is now usually employed when no other means are at hand. It was the one used by the Russians when they first started searching for the mines which the Japanese placed in waters about the harbor-mouth at the siege of Port Arthur.

The Russians used two boats in dragging for mines, with a hawser stretched between them. It was soon found that little could be accomplished with this arrangement on account of the fact that the hawser in motion tended to rise toward the surface, and that it formed an acute angle in the middle, thus reducing greatly the area swept. The first of these difficulties was partially overcome by attaching weights to the cables where they were fastened to the sweeping-hawser. A further improvement, partially overcoming the second difficulty, was in placing floats at the ends of the cables, suspending weights from each float to the proper depth, and attaching the hawser to these weights. The floats were so constructed and attached as to cause them to sheer out, thus giving the sweep the necessary spread.

From this time dates the organization of the first mine-sweeping flotilla ever employed. It searched and cleared the channel on a regular plan, affording ships a safe ingress and egress. No Russian ships went out of the harbor until the mine-sweeping flotilla had first searched the channel. The use of floats and weights necessitated a contrivance of great bulk, difficult to cast and haul in, and too heavy to permit of any but the slowest speed. To overcome these difficulties, use was made of the well-known theory that a pent-shaped log, towed behind a boat, can be kept at any given depth with any given speed by adjusting the tow-line to the proper length.

Sjostrand, a Swedish inventor, used this theory in producing his mine-sweeper, which consisted of a drag-hawser attached at the ends to logs or kites kept at the proper depth by regulating the length of cable and the speed of the vessel. The kites were constructed and attached in such manner as to cause them to sheer out and maintain a wide spread of sweep. This device was in reality only a mine-searcher. An improvement converted it into a mine-remover as well. The hawser was so attached to the cable at one end that, upon encountering a mine-mooring, it would break from the cable. At the loose end was fixed a grappling-hook containing an explosive charge. The mooring having been encountered and the hook end freed thereby, the hawser was dragged along the mine cable until the hook or catcher grappled and held it. The charge was then exploded from the ship and the mine destroyed or brought to the surface.

The removal of mines brought to the surface is most easily accomplished by firing into them; for this work, small-calibre guns firing shell are provided. Small-bore rifle bullets make holes so small that the water enters very slowly into the mines. Guns firing shell produce much larger holes, and there is always the possibility of exploding the mine with a fragment. The great importance which the experience of war attaches to all means of combating mines has led to the production of a great many appliances, but none of them are practicable, so that the mine-sweeping appliance of Swedish origin remains the most advanced and the best. This sweep is useful only against mines which are anchored, since it attacks the moorings. Against free mines, there is no protection except a sharp lookout. The only real protection against drifting mines lies in the development of naval aircraft, from which the location of mines can be established, especially drift mines, which float on or near the surface.

EDWARD S. FARROW,
Consulting Military and Civil Engineer.

MINE WORKERS OF AMERICA, United, an American labor organization, formed 25 Jan. 1890, to «unite mine employees that produce or handle coal or coke . . . and ameliorate their condition by means of conciliation, arbitration, or strikes.» Its executive officers are president, vice-president and secretary-treasurer; a national executive board is made up of these officers and of 25 delegates, one each from the various district divisions. The United Mine Workers made great gains in membership by its bituminous strike in 1897, and by the famous anthracite strikes of 1900 and 1902; the two last mentioned strikes were under the leadership of Pres. John Mitchell (q.v.). The policy is typically aggressive and almost the entire funds of the union are used to support strikes and spread the organization. The organ is *The United Mine Worker.*

MINER, Alonzo Ames, American Universalist clergyman: b. Lempster, N. H., 17 Aug. 1814; d. Boston, Mass., 14 June 1895. He was educated in secondary schools, taught for a time, was ordained to the Universalist ministry in June 1839, was pastor at Methuen, Mass. (1839–42), and at Lowell (1842–48), was colleague of Hosea Ballou at Boston (1848–52), and full pastor (1852–62; 1874–95). In 1862–74 he was president of Tufts College (Medford, Mass.). He originated the Universalist Publishing House, Boston; was chairman of the American Peace Society, which he represented at the international congress, Paris, 1889; was Prohibition candidate for governor of Massachusetts in 1878 and for mayor of Boston in 1893; and was also once known as a lecturer on anti-slavery. He edited the *Star of Bethlehem* at Lowell, and published ‹Bible Exercises› (1854–84); ‹Old Forts Taken› (1878–85); ‹Doctrines of Universalism.› Consult Emerson, G. H., ‹Life of Alonzo Ames Miner› (Boston 1896).

MINER, Charles, American journalist: b. Norwich, Conn., 1 Feb. 1780; d. Wilkesbarre, Pa., 26 Oct. 1865. At the age of 19 he removed to the Wyoming Valley, Pennsylvania, where, with his brother, he established the *Luzerne Federalist* and afterward *The Gleaner,* for which he wrote humorous sketches. Subsequently he became assistant editor of the *Political and Commercial Register* of Philadelphia and also established, with his brother, the West Chester *Village Record,* to which he contributed under the name of «John Harwood.» He was a member of Congress from Pennsylvania in 1825–29 and was the first to bring to the notice of that body the possibilities of the culture and manufacture of silk in the United States. His ‹History of Wyoming› (1845) contains a vivid description of the Wyoming massacre, obtained from an eye-witness.

MINER, William Harvey, American journalist and author: b. New Haven, Conn., 5 March 1877. He took a special literary course at Yale University in 1896 and was graduated at Columbian (now George Washington) University in 1899. For a time he was a staff member of the Lowell (Mass.) *Mail.* He traveled extensively in the Middle and Far West, in Canada and in Europe and published ‹George Catlin, a Memoir› (1900); ‹The Lewis and Clark Expedition› (1901); ‹Daniel Boone› (1901); ‹The Rowfant Club› (1903); ‹The Beginnings of American Science› (1906); ‹Savage and Chatterton› (1907); ‹Life of Charles Churchill› (1907); ‹The Iowa Indians› (1911); ‹History of the American Indians, North of Mexico› (1913).

MINERAL ACIDS, Toxicology of. Poisoning by ingestion of sulphuric acid causes pain in mouth, nose, throat and epigastrium; bloody saliva; vomiting, bloody diarrhœa; feeble pulse; cold, damp surface; and collapse. Ulceration of stomach and larynx may occur and if the patient survives, a form of Bright's disease follows quickly. The antidote is any available alkali as soap, chalk, magnesia or whitewash, scraped, perhaps, from a wall. Hydrochloric acid (q.v.) causes similar though possibly less severe symptoms and recovery is more often possible. The antidotes are the same. Nitric acid (q.v.) exceeds sulphuric in the violence of the symptoms caused, with sudden death. Instead of black sloughs in the mouth, œsophagus and stomach, such as occur in sulphuric-acid poisoning, in nitric-acid intoxication yellow sloughs and stains are found after death. Nitromuriatic-acid poisoning resembles poisoning by nitric acid in symptoms and pathological results. Similar yellow staining is found. The antidotes are alkalis. Phosphoric acid (q.v.) is not corrosive to animal tissues, though the glacial acid coagulates albumen. Its antidote is any alkali at hand, but its effects are not highly dangerous. See ACIDS; TOXICOLOGY.

MINERAL COLORS, inorganic materials in the making of paint. They date as far back (or farther) in the history of coloring materials as organic materials, the paints used by primitive peoples for personal decoration being more commonly of this class. In Greek painting the main sources of coloring matters were carbonate of chalk for whites; red and yellow ochres; and carbon. Apparently these same colors were used in Egyptian wall-painting. The range was much widened at the beginning of the Christian era at Rome and the chemical activity of the last century has added largely to the mineral sources of colors. These may be roughly classified as follows: Whites from calcium, for example, carbonate and sulphate; from barium, for example, sulphate (natural and artificial) and tungstate; from lead, for example, carbonate, hydrocarbonate, sulphate, antimonite, tungstate; from zinc, the oxide, oxychlorine, etc.; from silicum and talc; from antimony; and from the hyponitrate of bismuth. Reds are based on iron, as sesquioxide and red ochre; on mercury; on lead, as minium; on arsenic, as arseniate of cobalt; on antimony and on gold. The greatest source of yellows is chromic acid derivatives; next the lead colors; and then the ochres and other minor sources. Blues are derived from copper (hydrate, arseniate, carbonate), from cobalt (aluminates and silicates) and from iron (phosphates, etc.); greens from chrome (notably sesquioxide), copper, manganese, etc.; and blacks mostly from carbons. An excellent handbook of the subject is Perret, ‹Couleurs Minérales› (1902).

MINERAL LAND LAWS OF THE UNITED STATES. Mineral lands of the United States are disposed of under the general laws dating back to 1866. Lands containing valuable mineral deposits may be acquired by one of two methods, the first as provided for lode claims and the second as provided for placer claims. The applicant must be a citizen of the United States or have declared his intention to become a citizen. Each person in the case of an unincorporated association must be similarly qualified and a corporation making mineral entry must be organized under the laws of the United States or of any State or Territory.

Lode claims are those based upon a lode, ledge or vein of mineral-bearing rock and they may include an area of not more than 1,500 linear feet along the course of the vein and not more than 300 on each side of the vein; that is an area of about 10½ acres. The law, however, recognizes the local laws and customs which may provide for smaller limits in the area to be taken. This method of acquisition is intended to include gold, silver, copper, lead, tin and other similar minerals occurring in veins. One who discovers a mineral deposit may record his claim in the local county records as provided by the State laws or regulations and he may retain the right of possession indefinitely by performing $100 worth of labor thereon annually or making improvements of equivalent value. Patent from the United States may be obtained by filing mineral entry in the local land office and making proof in accordance with the law and the regulations.

Placer claims are those allowed in the case of discovery of mineral deposits not occurring in a lode or a vein. These claims may not exceed 20 acres in the case of an individual nor 160 acres by an association of persons. Annual proof of $100 worth of labor or improvement is required as in the case of lode claims and there must also be proof of improvements of a value not less than $500. Besides the precious minerals, placer claims have been extended to include deposits of phosphates, oil, gas, etc. Patent is obtained in the same manner as in the case of lode claims. By the Act of 17 July 1914 Congress provided for agricultural entries in the case of lands classified as containing phosphate, nitrate, potash, oil, gas or asphaltic minerals. This permits the use of the surface of the land for agricultural purposes in such a way as not to interfere with the extraction of these minerals. Mineral lands are supposed to be classified at the time of survey by the surveyor who indicates the several areas which appear to be agricultural or mineral; but lands not so classified as mineral may be acquired under the mineral laws.

The coal land laws provide for the acquisition of lands valuable for coal by entry by an individual above the age of 21 who is a citizen of the United States or has declared his intention to become such and shall not exceed 160 acres. An association of persons may take 320 acres but each person composing an association must be qualified as in the case of an individual entryman. When an association of not less than four persons each qualified as above shall have expended not less than $5,000 in working and improving a mine or mines of coal upon the public lands, such association may enter not exceeding 640 acres, including such mining improvements. Only one entry of coal lands may be made by any person or association of persons.

The land must be paid for at its appraised value according to the estimated amount and character of the coal therein, the price being not less than $10 per acre when situated not more than 15 miles from a completed railroad and $20 when situated within 15 miles of a completed railroad.

In the Territory of Alaska coal land can be acquired only by lease in tracts not exceeding 2,560 acres to any person above the age of 21 who is a citizen of the United States or to any association of such persons or to any corporation or municipality organized under the laws of the United States or of any State or Territory. These leases are offered through advertisement, competitive bidding or such other method as the Secretary of the Interior may adopt. The lessees shall pay such royalties as may be specified in the lease which shall not be less than two cents per ton and an annual rental at the rate of 25 cents per acre for the first year, 50 cents for the second, third, fourth and fifth years and $1 per acre for every year thereafter during the continuance of the lease, which may not exceed 50 years, but shall be subject to renewal on such terms and conditions as may be authorized by law at the time of such renewal. The earliest action in regard to the mineral lands of the United States is found in the ordinance of 20 May 1785 for the disposal of lands in the Western Territory passed by Congress under the Articles of Confederation, and provided for the reservation of one-third of all gold, silver, lead and copper mines to be sold or otherwise disposed of. By the Act of 3 March 1807 Congress inaugurated the plan of leasing mineral lands. This method of dealing with the mineral lands was continued in force until the conditions developed by the discovery of gold in California and other Pacific States forced Congress to take more definite action. As a result of long years of investigation Congress by the Act of 26 July 1866 provided the means for acquiring title to mineral lands, the areas and other conditions of acquisition to be subject to the local customs or rules of miners in the district where the land is located. This method was adopted because in the absence of any definite law miners in each district were forced to organize and adopt some plan for defending and protecting the rights of those who were discovering and working mineral claims. While there was a similarity in the local rules so adopted there was sufficient variation to make it rather difficult for Congress to fix specific conditions at that time. By gradual developments the law in regard to mining and placer claims was fixed as above described.

Under the Acts of Congress of 17 July 1917 and the Soldiers' and Sailors' Civil Relief Act of 8 March 1918 no right to any entry or claim to the public lands will be subject to cancellation or forfeiture while the applicant is in military service.

There is a general feeling among those interested in mines and mining that present laws and decisions of the courts are not well adapted to future development and there is a strong movement on foot for a codification of the mining laws so that they may better apply to the present conditions of the mining industry.

Morris Bien,
United States Reclamation Service, Washington, D. C.

MINERAL METABOLISM. See Pathology.

MINERAL PAINTS. See Mineral Production in the United States.

MINERAL PHOSPHATES. See Fertilizers.

MINERAL POINT, Wis., city in Iowa County, 50 miles west of Madison, on the Chicago, Milwaukee and Saint Paul and the Mineral Point and Northern railroads. Iron, lead, zinc and sulphur are found in the vicinity. The chief industry is the manufacture of oxide of zinc, lead and sulphuric acid. The city owns waterworks, a public library, a high school building and a municipal auditorium. Mineral Point was settled in 1827. Pop. 2,925.

MINERAL PRODUCTION OF THE UNITED STATES. The output of mineral products in the United States has had a steady increase for many years and in 1922 reached a grand total of more than $4,652,000,000. The European War had great influence in increasing

Total Value of Mineral Products of the United States from 1880 to 1916.

(United States Geological Survey).

YEAR	Metallic	Non-metallic	Unspecified (metallic and non-metallic)[1]	Total
1880	$187,880,880	$173,581,917	$6,000,000	$367,462,797
1881	189,413,459	207,207,019	6,500,000	403,120,478
1882	215,820,070	230,785,547	6,500,000	453,105,617
1883	197,881,610	243,679,889	6,500,000	448,061,499
1884	180,284,208	221,755,346	5,000,000	407,039,554
1885	172,218,218	242,332,845	5,000,000	419,551,063
1886	204,399,872	250,985,090	800,000	456,184,962
1887	240,791,068	294,041,980	800,000	535,633,048
1888	242,010,000	310,888,983	900,000	553,798,983
1889	250,324,369	291,001,413	1,000,000	542,235,782
1890	303,440,430	310,988,907	1,000,000	615,429,337
1891	280,484,844	319,363,338	1,000,000	600,848,182
1892	283,715,295	337,516,444	1,000,000	622,231,739
1893	223,153,770	321,339,395	1,000,000	545,493,165
1894	186,835,353	362,409,394	1,000,000	550,244,747
1895	248,033,039	393,658,083	1,000,000	642,691,122
1896	252,075,130	387,965,870	1,000,000	641,041,000
1897	269,934,178	380,677,600	1,000,000	651,611,778
1898	308,247,446	417,794,018	1,000,000	727,041,464
1899	483,520,531	525,571,880	1,000,000	1,010,092,411
1900	513,731,959	594,194,796	1,000,000	1,108,926,755
1901	493,313,578	660,764,256	1,000,000	1,155,077,834
1902	604,517,044	722,433,728	1,000,000	1,327,950,772
1903	588,753,010	905,628,365	1,000,000	1,495,381,375
1904	501,114,224	859,074,529	400,000	1,360,588,753
1905	702,584,608	921,181,524	400,000	1,624,166,132
1906	886,179,981	1,016,390,015	200,000	1,902,769,996
1907	904,093,201	1,165,748,197	100,000	2,069,941,398
1908	550,744,388	1,043,702,454	250,000	1,594,696,842
1909	754,940,809	1,131,515,921	300,000	1,886,756,730
1910	749,876,234	1,241,039,986	300,000	1,991,216,220
1911	680,888,929	1,245,145,079	250,000	1,926,284,008
1912	866,381,073	1,377,152,760	500,000	2,244,033,833
1913	883,222,012	1,555,517,716	420,000	2,439,159,728
1914	691,081,734	1,423,648,599	470,000	2,115,200,333
1915	992,816,853	1,393,565,098	7,450,000	2,393,831,951
1916	1,621,832,177	1,878,507,232	15,000,000	3,525,339,409
Grand total	$17,906,535,584	$25,358,755,213	$79,040,000	$43,354,330,797

[1] Estimated.

the production in 1914–16 for a vast amount of mineral matter was consumed in many lines of manufacturing, munitions, ship-building, etc., connected with the conflict. The values of mineral products from 1880 to 1916 and the production of the principal minerals in 1916 are given in the following tables together with the figures for 1908 for comparison. They are taken from the data obtained by the United States Geological Survey.

Mineral Production of the United States.

(First Products).

PRODUCTS	1908		1916	
	Quantity	Value	Quantity	Value
Arsenious oxide			5,986 short tons	$555,186
Asbestos	936 tons	$19,624	1,479 short tons	448,214
Asphalt[1] and bituminous rock	78,565 short tons	517,485	98,477 short tons	923,281
Barytes	38,527 short tons	120,442	221,952 short tons	1,011,232
Bauxite	52,167 long tons	263,968	425,100 long tons	2,296,400
Borax (crude)	25,000 short tons	975,000	103,525 short tons	2,409,459
Bromine	1,055,636 pounds	102,344	688,260 pounds	922,225
Cement, natural	1,686,862 barrels	834,509	842,137 barrels	430,874
Cement, Portland	51,072,612 barrels	43,547,679	94,552,296 barrels	104,258,216
Chrome ore	359 long tons	7,230	47,035 long tons	726,243
Clay products		133,197,762		207,260,091
Coal, anthracite	74,347,102 long tons	158,178,849	78,195,083 long tons	202,009,561
Coal, bituminous	332,573,944 short tons	374,135,268	502,519,682 short tons	665,116,077
Emery	669 short tons	8,745	15,282 short tons	123,901
Feldspar	70,474 short tons	428,553	132,681 short tons	702,278
Fluorspar	38,785 short tons	225,998	155,735 short tons	922,654
Fuller's earth	29,714 short tons	278,367	67,822 short tons	706,951
Garnet	1,996 short tons	64,620	6,171 short tons	208,850
Glass sand	1,093,553 short tons	1,134,599	2,018,317 short tons	1,957,797
Graphite, crystalline	144 short tons	132,840	5,416 short tons	914,748
Graphite, amorphous	1,443 short tons	75,250	2,622 short tons	20,723
Grindstone				766,140
Gypsum	1,721,829 short tons	4,075,824	2,757,730 short tons	7,959,032
Iron ore	35,983,336 long tons	81,845,904	77,870,553 long tons	181,902,277
Iron ore, manganiferous	55,620 long tons	132,556	548,803 long tons	2,005,491
Lithium minerals	203 short tons	1,550	619 short tons	12,035
Magnesite	6,587 short tons	19,761	154,974 short tons	1,393,693
Manganese	6,144 long tons	62,779	26,997 long tons	627,417
Mica, scrap	2,417 short tons	33,904	4,433 short tons	69,906
Mica, sheet	972,964 pounds	234,021	433 short tons	524,485
Marls	8,469 short tons	4,330		
Millstones		31,420		44,559
Monazite	422,646 pounds	50,718	37,872 pounds	3,400
Mineral paints	68,694 short tons	2,410,367	135,606 short tons	23,515,803
Mineral waters	55,868,820 gallons sold	6,712,680	55,928,461 gallons	5,735,035
Molybdenum			1,228 short tons	114,866
Natural gas		54,640,374		120,227,468
Oilstones		217,284		154,573
Petroleum	178,527,355 barrels	129,079,184	300,767,158 barrels	330,899,868
Phosphate rock	2,386,138 long tons	11,399,124	1,982,385 long tons	5,896,993
Peat		133,000		369,104
Pumice	10,569 short tons	39,287	33,320 short tons	82,263
Precious stones		415,063		217,793
Pyrite	222,598 long tons	857,113	423,556 long tons	1,965,702
Quartz (Silica)	47,316 short tons	190,157	88,514 short tons	242,786
Salt	28,822,062 barrels	7,553,632	6,362,906 short tons	13,645,947
Sand and gravel	36,122,491 short tons	12,135,433	87,073,415 short tons	27,852,198
Sand-lime brick		1,029,699		1,474,073
Slate		6,316,817		5,338,837
Soapstone and common talc	46,615 short tons	703,832	119,725 short tons	1,292,293
Soda, natural				
Stone, building		16,040,630		79,041,699
Stone, crushed		20,262,012		
Sandstone		7,594,091		
Stone, limestone		27,682,002		
Strontium minerals			250 short tons	
Sulphur	369,444 long tons	6,688,215	Not public.	
Sulphuric acid from smelters			1,069,589 short tons	14,099,927
Talc, common; see Soapstone				
Talc, fibrous	70,739 short tons	697,390	93,236 short tons	961,510
Tripoli and infusorial earth		97,442		241,553
Thorium, see Monazite				
Titanium ores	Not any		205 short tons	18,400
Tungsten ores	671 short tons	229,955	5,923 short tons	12,074,000
Zinc ore, exported	26,108 short tons	877,745		
Zinc, oxide	56,292 short tons	5,072,460		
Uranium and vanadium minerals			20,300 short tons	500,000
Estimated miscellaneous		8,000,000		15,000,000
Grand total		$1,595,670,186		$3,525,339,409

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[1] Not including asphalt manufactured for American petroleum.

PRODUCTION OF METALS IN THE UNITED STATES.

(First Products).

PRODUCTS	1908		1916	
	Quantity	Value	Quantity	Value
Aluminum	11,152,000 pounds	$2,434,600	....	$33,900,000
Antimonial lead	13,629 short tons	1,264,771	24,038 short tons	4,463,582
Antimony	....	....	4,500 short tons	40,580
Cadmium	....	....	135,212 pounds	205,433
Copper	942,570,721 pounds	124,419,335	1,927,850,548 pounds	474,288,000
Ferro alloys	152,018 long tons	6,080,720	589,738 long tons	50,281,692
Gold	4,574,340 Troy ounces	94,560,000	4,479,056 ounces	92,590,300
Iron, pig	15,936,018 long tons	254,321,000	39,126,324 long tons	663,478,118
Lead	310,762 short tons	26,104,008	552,228 short tons	78,207,000
Magnesium	....	....	75,401 pounds	311,462
Molybdenum	....	....	206,740 pounds	205,000
Nickel	....	....	918 short tons	671,192
Platinum	750 Troy ounces	14,250	28,088 ounces	2,301,762
Quicksilver	19,752 flasks	824,146	29,932 flasks	2,576,547
Silver	52,440,800 Troy ounces	28,050,600	74,414,802 Troy ounces	48,953,000
Tin	few tons	....	278,000 pounds	120,874
Zinc	190,749 short tons	17,930,406	563,451 short tons	151,005,000

SOME IMPORTANT SECONDARY MINERAL PRODUCTIONS OF THE UNITED STATES.

PRODUCTS	1908		1916	
	Quantity	Value	Quantity	Value
Asphalt from petroleum	102,281 short tons	$1,322,616	688,334 short tons	$6,178,851
Alum	7,700 short tons	236,710	27,257 short tons	1,177,881
Alumina sulphate	....	....	153,860 short tons	4,410,741
Alumina abrasive (alundum, etc.)	1,580 short tons	189,600	30,708 short tons	2,139,230
Ammonium sulphate	87,600 short tons	5,247,240	....	....
Arsenic	2,603,505 pounds	99,193	11,972,000 pounds	555,186
Bromine	1,149,000 pounds	103,410	688,260 pounds	922,225
Calcium chloride	....	....	26,062 short tons	216,129
Cement, slag	4,535,300 barrels	3,628,240	....	....
Coke	23,496,666 short tons	55,595,792	54,533,585 short tons	170,841,197
Copper sulphate	37,654,961 pounds	1,833,796	49,728,577 pounds	....
Copperas	35,334 short tons	388,674	....	....
Graphite, artificial	7,385,511 pounds	502,667	8,398,000 pounds	....
Lead, white	125,728 short tons	11,488,315	128,977 short tons	21,274,480
Lead, red and orange mineral	11,751 short tons	1,199,339	23,035 short tons	3,933,566
Lime	2,766,873 short tons	11,091,186	4,083,803 short tons	18,618,816
Litharge	12,254 short tons	1,231,206	37,739 short tons	5,853,543
Manganese residuum	110,225 long tons	220,450	Not public	....
Mineral wool	9,197 short tons	77,228	Not public	....
Potash	....	....	9,720 short tons	4,242,730
Silicon carbides (carborundum, etc.)	2,453 short tons	294,430	7,025 short tons	707,120

The various mineral products of economic importance are described in detail under separate headings throughout the Encyclopedia. The following is a brief review of the source in the United States of the principal ones in the above lists:

ANTIMONY.— Chiefly used for hardening lead; was in considerable demand during the World War. Part is produced as antimonal lead. Since 1915 Alaska has furnished a large proportion of the antimony ore; same comes also from California, Nevada, and a few other Western States.

ALUMINUM.— The extensive demand for aluminum lightweight machinery and utensils and the lowering of its price by improved methods of reduction account for the vast increase in its production in the last decade. Much of it is made from bauxite largely mined in Pulaski and Saline counties, Ark., with smaller supplies from Georgia, Alabama and Tennessee.

ARSENIC.— The arsenic of commerce extensively used in making dyes, glass, poisons and drugs is mostly produced from mines in Washington and small amounts are obtained from some of the smelters.

ASBESTOS.— Most of our supply of this useful mineral fibre is imported from Canada (133,339 tons in 1916), but small amounts are mined 40 miles northeast of Globe, Ariz., and near Salt Mountains, Georgia. The fine asbestos in the bottom of the Grand Canyon appears to be too inaccessible to be utilized.

ASPHALT.— Besides the 688,334 tons of asphalt produced from petroleum, natural asphalts and bituminous rocks are mined at various places in Utah, California, Kentucky and Texas. While much of the material is used for roads, the minerals gilsonite, grahamite, wurtzilite and ozocerite have many uses in the arts.

BARYTES.— Used principally as white pigment notably in "lithopone," is mostly mined in Georgia, Missouri, Tennessee, Kentucky, South Carolina, North Carolina, Alabama and southwestern Virginia. Production has been increasing steadily and in 1910 it passed the $1,000,000 mark.

BISMUTH.— This metal is used mostly in alloys for safety fuses, and in medicine. It is separated from various ores at several smelters and is also mined in small amounts in Colorado and Utah.

BORAX.— This salt is produced from colemanite mined in a few localities in southern and southeastern California.

The famous Death Valley mines are no longer large producers.

Bromine.— Separated from salt brines at several places in Michigan and West Virginia and at Pomeroy, Ohio. It is used extensively in photography, for dissolving gold and in various chemicals and medicines.

Cadmium.— Produced in small amount as a by-product in lead and zinc smelting, is used as an alloy for safety plugs of automatic fire extinguishers, for increasing the malleability of silver for silverware, in pigments and in dental amalgam. Its value is about $1.50 a pound.

Cement.— There is almost an unlimited supply of limestone and other materials available for making Portland and other cements but their utilization depends on the demand and proximity to market. Pennsylvania leads in its manufacture but Indiana, Iowa, California and New York are important producers.

Chromium.— Chromite or chromate of iron is the principal source of this metal which is in great demand for hardening steel. It is also used for pigments, notably in one which gives khaki its distinctive tint. Shasta County, Cal., is the largest producer but additional supplies come from other parts of that State and from Oregon, Wyoming and Maryland.

Clay.— See Clay.

Coal.— See Coal.

Copper.— Arizona is the leading producer of copper with Montana second, Michigan third and Utah fourth. Several other States have large yields, notably Nevada, New Mexico, Alaska, and California. The only Eastern State is Tennessee, where the Ducktown mines contributed nearly 8,000 tons.

Emery.— Ordinarily a large amount of emery is imported from Asia Minor and Greece. It is mined near Peekskill, N. Y., the purer mineral corundum is produced in North Carolina and imported from Canada.

Feldspar.— Used mainly in making pottery, china and enamels and there are projects for using it as a source of potash. The principal production is from Maine, with small amounts from Maryland, New York, North Carolina, Pennsylvania, Georgia and Virginia.

Fluorspar.— An important agent in the manufacture of open-hearth steel. Illinois and Kentucky afford the largest supplies with small amounts from Colorado, New Hampshire, New Mexico and Arizona.

Fuller's Earth.— But little Fuller's earth is now employed for fulling cloth, its principal use being for decoloring oils and fats. Florida, Arkansas, California, Georgia, Massachusetts and Texas are the principal producers with 80 per cent from Florida at an average price of $10.62 a ton. The vast deposits between the Black Hills and Big Bad-Lands in South Dakota are not yet utilized.

Garnet.— This mineral is considerably harder and tougher than quartz and is used as an abrasive for leather and wood, and general grinding and polishing. The principal supply comes from Adirondack Mountains, and from New Hampshire and North Carolina.

Glass Sand.— A sand of much more than ordinary purity is required for high grade glass. Uniformity of size of grain and low percentage of iron, magnesia and clay are important requisites. Illinois, southern New Jersey, West Virginia, western Maryland, Missouri and Ohio are the principal producers with small amounts from a dozen other States. The friable Saint Peter sandstone of Illinois is the source of about 500,000 tons a year.

Graphite.— Graphite or "black lead" occurs mostly in metamorphic rocks either in grains or in veins of various sizes. Some deposits are coal beds baked by igneous rocks. Most of the domestic production is from Alabama and the southeastern slope of the Adirondacks in New York, Texas, Pennsylvania and California. An amorphous variety comes from near Providence, R. I. Much artificial graphite is produced in electric furnaces at Niagara Falls. The chief uses are "lead" pencils, lubricants, crucible, stove polish and paint. A large amount is imported.

Grindstone.— Ohio with 22 quarries leads in the production of grindstones but there are also quarries in Michigan and West Virginia.

Gypsum.— This mineral when roasted and ground is plaster of Paris. It occurs in large amounts in many parts of the western United States, notably New Mexico, Wyoming, Utah and Texas, but New York, Michigan and Iowa yield the largest part of the product. The usefulness of the deposit depends largely on its proximity to markets.

Iron Ore.— About 82 per cent of the ore is mined in the Lake Superior region. The Birmingham district in Alabama contributes about 10 per cent and smaller amounts come from New Jersey, New York, Pennsylvania, Georgia, Tennessee, North Carolina and some other States. The amount mined in the Far West is about 1 per cent. Iron ore being pre-eminently a war mineral the production was greatly increased in 1915 and succeeding years. Iron ores containing manganese have lately become very important because of diminution of foreign shipments of manganese during the war and the great need of that metal in steel making. Manganiferous iron ores occur most extensively in the Cuyuna district, central Minnesota, but smaller deposits at Leadville, Colo., Philipsburg, Mont., Tombstone, Ariz., and Franklin, N. J., and near Batesville, Ark., are also producing.

Lead.— A large amount of lead is produced in the reduction of silver ores, especially when the price of silver is high. Missouri leads in lead production with Idaho not far behind, Utah third and Colorado far behind as fourth. Smaller amounts come from Nevada, Arizona, Montana, Oklahoma, Wisconsin and a few other Western States.

Lime and Limestone.— Limestone is quarried in part for burning and in part for building stone in 43 of the 48 States and large bodies of the rock are in proximity to the larger industrial centres. Production in the Western States is relatively small because of limited market. A large amount of limestone is used for Portland cement and road metal. Some is used in agriculture.

Lithium Minerals.— Lithia salts are used in small amounts in manufactured mineral waters and in storage batteries. Spodumene and amblygonite from the Black Hills, and lepidolite (lithia mica) and amblygonite from near Pala in California, are the principal sources.

Magnesite.— Carbonate of magnesia extensively used in the basic open-hearth process of steel making is mostly produced from mines near Porterville, Tulare County, Cal. Smaller amounts come from adjoining counties and from newly discovered deposits of crystalline mineral 60 miles north of Spokane, Wash.

Manganese.— As this metal is required in large amounts in modern steel-making, the ore is in great demand. Much is imported. Most of the mines in the United States are in Georgia, California, Virginia and Arkansas. Manganiferous iron ores, ores in some of the silver mines and residue from zinc ore of Franklin, N. J., are also native sources of the metal.

Marls.— Marls containing the potash-bearing greensand, glauconite, are dug in southern New Jersey and eastern Virginia for fertilizer both for direct use on the fields and for admixture with fish scraps.

Mica.— With the vast increase in manufacture of electrical supplies mica production is continually increasing, especially as the small plates are now utilized for insulating. Ground mica is also in demand and mica board is made by compressing small fragments. The principal supply comes from North Carolina and some is mined in the Black Hills of South Dakota, New Hampshire and Virginia. Much is imported from Canada and India.

Millstones and Grindstones.— Sandstones quarried in eastern New York, Pennsylvania, North Carolina and Virginia, Ohio, Michigan, West Virginia. Both have to be of particular hardness and structure.

Mineral Paints (ochre, umber, sienna, Indian red, etc.).— These pigments are oxides of iron varying from deep-red hematite to light-yellow ochre and mostly containing considerable clay. Principal production is from Georgia, Pennsylvania, New York and Tennessee with small amounts from California and Vermont.

Mineral Waters.— Waters from mineral springs are bottled at many localities and some of them are shipped to distant markets. Saratoga, N. Y., is a large producer. See special article on this subject.

Molybdenum.— Used mainly in steel-making is obtained from ores from a few mines in Arizona with smaller amounts from California, New Mexico and Utah.

Monazite.— The principal source of thoria used extensively in incandescent gas mantles. Some varieties carry as much as 20 per cent. Most of the native supply is from North Carolina and South Carolina.

Natural Gas.— Wells producing the largest amounts of natural gas are in West Virginia, Pennsylvania, Ohio, Oklahoma, Kansas, California, Texas, New York and Louisiana. West Virginia yields more than one-third, having been in the lead since 1910.

Nickel.— Is used in most high grade steels, especially in armor plate. The only production from native ore is a by-product in the electrolitic reduction of certain copper ores.

Peat.— The extensive deposits of peat in the North Central States and New England are not drawn on very heavily for fuel in this country but considerable is used for fertilizers and for mixing with stock food.

Petroleum.— See Petroleum.

Phosphate Rock.— Calcium phosphate occurs in various forms in nature from the mineral apatite to fossil bones. Large bodies of phosphate rock occur in Montana, Idaho, Utah and Wyoming, Arkansas, Tennessee, South Carolina and Florida. The South Carolina deposits have been worked since 1867, the Florida deposits from 1888. The vast beds in the Far West are not yet utilized extensively and the deposits in north central Arkansas are only worked on a small scale. See Fertilizers.

Platinum.— This metal, used most extensively for part of the apparatus for producing sulphuric acid by the contact process, is mostly imported from Russia and Colombia. In 1916 about 710 ounces were obtained in gold dredging in California and Oregon.

Potash.— This material which is used mostly for fertilizer has been produced in the United States in quantity only, since imports from Germany were cut off. Natural brines furnished about two thirds, alunite and furnace dust furnished about one-seventh, kelp one-fifth and the remainder came from distillery waste and ashes. The alkali lakes of western Nebraska yield a steady output and the great deposits of mixed salts at Searles Lake, California, are being utilized.

Pumice.— The volcanic ash mined in Nebraska, Kentucky, California, Idaho and Utah is termed pumice but as the material is pulverulent the name is a misnomer. It is used extensively in polishing powders called "cleansers."

Precious Stones.— See Gems.

Pyrite or iron sulphide is employed mainly for the manufacture of sulphuric acid. The native production is only about one-third to one-quarter of the amount used. Virginia and California are the principal producers with smaller amounts from Illinois, New York, Missouri, Indiana, etc.

Quicksilver.— About two-thirds of the ores of mercury are mined in California while nearly 30 per cent comes from Texas. Nevada, Arizona and Oregon yield smaller amounts. The use of mercury in detonators naturally caused greatly increased demand for the metal during the war.

Salt.— See Salt.

Sand-lime Brick.— Bricks made by heating a mixture of lime and sand are fast growing in popularity and more than a quarter of a billion were produced in 1917. Michigan leads in the production, with Minnesota second and Massachusetts third.

Silica.— Sand dug so extensively in many places for concrete and other uses consists of silica. Quartz and quartzite are also mined and crushed in various States for pottery, paints, polishes, polishing powders and soaps, sandpaper, filters and many minor uses.

Silver.— Many ores of gold have silver as a by-product and much silver occurs in lead ores. Ores of the latter class are worked extensively in the Cœur d'Alene district, Idaho; Park City, Tintic and San Francisco districts, Utah, and Aspen, Creede and Rico districts, Colorado, and some other localities in the West.

Slate.— Slates of various kinds come mostly from Vermont, eastern New York, Pennsylvania and Virginia, with smaller amounts from New Jersey, Maryland, Georgia, Arkansas, California and Minnesota. Most of it is used for roofing, but considerable of it is made into mantels, table tops, tiles, floorings, etc.

Soapstone and Talc.— Virginia is the principal producer of soapstone which is used largely for laundry tubs, switch boards and table tops. Talc or the purer mineral is mostly ground for toilet powders, paints, heat insulators, paper filler, lubricant and many minor uses. It is obtained mostly from near Gouverneur, N. Y. Some comes from North Carolina, Pennsylvania and California.

Stone, Building.— The great deposits of building stones in the United States are worked at many localities, some producing "sandstone," "marble," "granite" and a variety of others. Part of this is in building blocks and part crushed for concrete and road making. Nearly all the States produce some form of stone excepting along the coastal plain from New Jersey to Texas, where rock is scarce and in the interior Western States where the local demand is slight.

Strontium Minerals.— Celesite, the principal source of strontium, is mined in small amount in Arizona, California and Washington. It is used largely for making red fire in fireworks, signals, etc.

Sulphur.— Nearly all the sulphur produced in the United States come from Louisiana and Texas. It has been estimated that the consumption in 1916 was about 900-000 tons for paper, chemicals and explosives and other uses.

Tin Ore.— Tin is mostly imported, but 139 tons were produced from ore obtained in Alaska. A small amount comes from North Carolina. The deposits in Black Hills of South Dakota and San Bernardino County, Cal., are not producing.

Titanium Ores.— Rutile (TiO_2) is the principal source of titanium now used in electric lights, steel making and coloring artificial teeth and pottery glass. Nelson County, Va., is the principal producer.

Tripoli and Infusorial Earth.— Tripoli, a light-colored silica resulting from weathering of silicious limestone, is produced mostly in Missouri and rottenstone of similar origin is mined in central Pennsylvania. They are used for polishing powders. Infusorial or diatomaceous earth consists of silicious remains of minute aquatic plants. It is used as an absorbent, for fireproofing and in records for talking machines. The principal production is from California, Nevada and Maryland.

Tungsten Ore.— Tungsten is in great demand for hardening steel for use in high speed work and also for electric lamp filaments. Atolia, Cal., Boulder County, Colo., and Dragoon, Arizona, are the principal producers.

Uranium and Vanadium Minerals.— Carnotite, the most important ore of uranium and vanadium in the United States, also contains minute amounts of radium. This ore is obtained mostly from western Colorado and adjoining portions of Utah, disseminated in sandstone or in joints. It also is obtained near Green River, Utah. Uvanite is produced near Temple, Utah. Pitchblende is mined near Central City, Colo. Vanadium is used for hardening steel; it is mined in San Miguel County, Colo.

Zinc Ore.— Zinc is produced directly from various zinc ores and also as a by-product in working lead and silver ores. Leadville, Colo., and Cœur d'Alene, Idaho, are important producers of the latter. The Joplin district of Missouri furnishes about one-fourth of the zinc ore and Franklin Furnace, N. J., and Butte district, Mont., each yield about one-fifth.

Nelson H. Darton,
Geologist, United States Geological Survey.

MINERAL TALLOW, also called hachittite, a yellowish-white, soft and inodorous mineral wax, or tallow, that melts at 115° to 170° F. It is composed of about 86 per cent carbon and 14 per cent hydrogen. The substance is closely related to ozocerite. It is found in Wales, Scotland, Moravia, Austria, Germany and Siberia.

MINERAL WATERS, a term used to designate such waters as have as constituents an unusual proportion of medicinal minerals. Mineral waters have been used as remedial agents from the earliest days of Greece and Rome. There were sulphurous thermal springs at Tiberius, which are still used by invalids from all parts of Syria, in cases of tumor, rheumatism, gout and other diseases. There are also warm springs at Calirrhoe, near the Red Sea, which are mentioned by Josephus as having been tried by Herod in his sickness. The Romans discovered the thermal springs in Italy, and the springs in other parts of Europe — Baden-Baden, Aix-la-Chapelle, the Spa in Belgium and others. Pliny mentions mineral springs in various parts of Europe.

Classification.— No classification of mineral waters based upon their chemical composition can be strictly exact, because many springs are intermediate between well-characterized groups. The following classification is regarded as the most comprehensive:

The first general division is as to thermal or non-thermal. Waters which issue from the ground at a temperature above 70° F. belong in the first class; those whose temperature is below 70° to the second class.

Four divisions are made as to the chemical constitutions of the several waters: (1) the alkaline; (2) the alkaline-saline; (3) the saline, and (4) the acid. The *alkaline* waters are those which have an alkaline reaction and contain carbonic acid or bicarbonic acid ions in predominating quantities; or boric or silicic acid ions in predominating quantities, so that their alkalinity is evidently due to the presence of borates or silicates. The *saline* waters are those having an alkaline or neutral reaction and contain sulphuric, muriatic or nitric acid ions in predominant quantities. The *alkaline-saline* waters come between the two groups just described: they have an alkaline reaction and contain sulphuric, muriatic or nitric acid ions along with carbonic or bicarbonic acid ions; or they contain sulphuric, muriatic or nitric acid ions along with boric acid or silicic acid ions — both classes being present by predominating constituents. The *acid* waters have an acid reaction and contain either sulphuric or muriatic acid ions in predominating quantities.

Mineral waters are also grouped as to their gaseous constituents: (1) non-gaseous; (2) carbon-dioxidated,— containing carbon dioxide gas; (3) sulphuretted — containing hydrogen sulphide gas; (4) azotized — containing nitrogen gas; (5) carbureted — containing methane gas, and (6) oxygenated — containing oxygen gas.

The scheme proposed by the United States Bureau of Chemistry for the exact classified descriptions of mineral waters is as follows:

Thermal or non-thermal	Sodic Lithic Potassic Calcic Magnesic Ferruginous Aluminous	Carbonated or Bicarbonated Borated Silicated	Alkaline	Arsenic Bromic Iodic Siliceous Boric Lithic Ferruginous Etc.	Non-gaseous Carbondioxated Sulphureted Azotized Carbureted Oxygenated
		Sulphated Muriated Nitrated	Alkaline-Saline		
		Sulphated Muriated Nitrated	Saline		
		Sulphated Muriated	Acid		

The description of a sample mineral water might read according to this schedule, «a non-thermic, calcic, bicarbonated, alkaline water»; or «a thermal, sodic, borated and carbonated, alkaline water» — and be exactly classified.

The substances which are usually sought for and measured quantitatively in mineral waters are basic radicales (*cations*): iron, aluminum, manganese, calcium, strontium, barium, magnesium, sodium, potassium, lithium, ammonium and hydrogen.

Acidic radicles (*anions*): chlorides, bromides, iodides, fluorides, carbonates, bicarbonates, sulphides, thiosulphates, sulphites, bisulphites, sulphates, bisulphates, nitrites, nitrates, arsenites, arsenates, metaborates, pyroborates, orthophosphates, metasilicates and hydroxides.

Gases: carbon dioxide; hydrogen sulphide; oxygen, and methane.

The therapeutic action of mineral waters depends chiefly upon their chemical composition and to some degree upon their temperature. Other circumstances, as situation, elevation, climate, geological formation and mean temperature have an important bearing upon the success of the treatment.

All drinking of these medicinal waters for remedial effects should be solely under the direction of a physician. The effects upon each individual are largely constitutional and a course of water beneficial to one may be highly injurious to another. As a general rule mineral water at the springs is taken before breakfast, at intervals of about a quarter of an hour between each tumbler, moderate exercise being taken in the intervals. In many cases bathing is of even greater importance as a remedial agent than drinking. Baths are generally between breakfast and dinner, and should never be taken soon after a full meal. The time during which the patient should remain in the bath varies very much at different springs, and the directions of the local physician should be strictly attended to on this point. As a general rule the treatment should not be protracted beyond the space of six weeks or two months, but on this point the patient must be solely guided by the physician resident at the springs. As regards temperature, if the waters are between 70° and 98° they are called tepid, while all exceeding the latter are classified as hot springs. The following examples give the degrees of temperature found in different thermal springs: Sweet Springs, W. Va., 74°; Warm Springs, French River, Tenn., 95°; Washita, Ark., 140° to 156°; San Bernardino Hot Springs, Cal., 108° to 172°; Las Vegas, N. Mex., 110° to 140°; Sulphur Springs, Aix-les-Bains, France, 108°; Kaiserquelle, Aix-la-Chapelle, Prussia, 131°; Carlsbad, Bohemia, 162°.

American Springs.— In the United States the Rock Spring was known at Saratoga, N. Y., among the Indians as early as 1767, and over 40 springs have since been discovered there. In 1830 springs were well and popularly known in West Virginia, and of these the Bath mineral spring, now known as the Berkeley Spring, was visited as early as 1777, while the White Sulphur Springs were used by the Indians in 1778. In these American springs, like those in Europe, the geologists agree that dissolved mineral substances are obtained from the rocks through which the water has flowed. The majority of waters contain carbonic acid which greatly increases their solvent powers in the presence of lime, magnesia and iron. If the waters are alkaline they may take up substances which are ordinarily rather insoluble, such as silica. There is, undoubtedly, more or less relation between hot springs and the geological structure of a region.

Alkaline Waters.— Simple alkaline acidulous waters are composed of carbonic acid and bicarbonate of soda. The most important springs of this class are the thermal springs of Las Vegas, N. Mex., and the cold springs at Sharon, N. Y. These waters are useful in certain forms of indigestion, jaundice, gallstones, gravel, gout and chronic catarrh of the respiratory organs. Muriated alkaline acidulous waters, which differ from the preceding, contain a considerable quantity of chloride of sodium. The most important springs of this kind are the thermal springs of Ems and the cold springs of Selters and Salzbrunn. They are useful in chronic catarrhal affections of the bronchial tubes, the stomach and intestines. Alkaline saline waters contain sulphate and bicarbonate of soda, such as the warm springs of Carlsbad, serviceable to patients suffering from abdominal plethora, if unconnected with diseases of the heart or lungs. These waters afford an excellent remedy for habitual constipation.

Bitter Waters.— The chief contents of these waters are the sulphates of magnesia and soda. The best-known springs of this class are those of Sedlitz and Kissingen; English examples are in the bitter waters of Cherry Rock, in Gloucestershire, and the Purton Spa, in Wiltshire, and in America the springs at Mount Clemens, Mich. These waters act as purgatives and diuretics.

Muriated Waters.— Simple muriated waters contain a moderate quantity of chloride of sodium or common salt. The chief springs of this class are Wiesbaden and Baden-Baden, which are hot; and those of Kissingen, Homburg and Cheltenham, which are cold. The muriated saline springs of Saratoga, in the United States, are some of them chalybeate, others sulphurous or iodinous; all of them being rich in carbonic acid gas. The Ballston saline springs near Saratoga have a very high proportion of carbonic acid. They are chiefly employed in cases of gout, rheumatism and scrofula. Muriated lithia waters contain chlorides of sodium and lithium. In gout they first aggravate the pain, but then give relief; and in periodic headache they have been found serviceable.

Earthy Waters.—These contain sulphate and carbonate of lime. The Wildungen water is a diuretic, and not only promotes the elimination of gravel, but by its tonic action on the mucous membrane of the urinary passages serves to prevent the formation of fresh concretions. It is also much used for chronic catarrh of the bladder. The baths of Leuk, in which many patients remain nine hours daily, until an eruption appears, are chiefly used in chronic skin diseases.

Mild Thermal Waters contain a small amount of saline constituents. Of the springs of this class the most important are Hot Springs, Ark., and Roanoke, Va. Their most striking effects are to stimulate the skin and excite the nervous system. They are especially used in chronic rheumatism and chronic gout and in diseases of the skin.

Chalybeate Waters.— Simple acidulous chalybeates contain carbonic acid and bicarbonate of protoxide of iron. Saline acidulous chalybeates contain sulphate of soda and bicarbonate of protoxide of iron. The quantity of iron present is very small — from .08 to .15 in 1,000 parts. Many of the chalybeate springs, especially in Germany, contain also much carbonic acid; carbonate, sulphate and chloride of sodium are frequently present and may help in the cure. The Putnam Spring at Saratoga and the springs of Maine and Massachusetts are examples of chalybeate wells which are very seldom thermal. Maine has both chalybeate and sulphurous springs. Chalybeate waters are valuable in anæmia.

Sulphurous Waters.— These waters contain sulphuretted hydrogen or metallic sulphides (sulphurets), or both. The most important sulphurous thermals are those of Aix-la-Chapelle, Baden, Barèges and Bagnères de Luchon, in Europe. There are hundreds of these sulphurous springs in the United States, including those at Mount Clemens, Mich., Bath, Va., and Warm Springs, Va. They are extensively used in chronic disease of the skin, and are of service in many cases in which exudations require to be absorbed, as in swellings of the joints, in old gun-shot wounds and in chronic gout and rheumatism. The sulphurous waters are employed externally and internally, and mineral mud-baths are believed by many physicians to form a valuable auxiliary.

Production.— The commercial output of mineral waters in the United States in 1916 amounted to 55,928,461 gallons, valued at $5,735,035. The imports in the same year amounted to 1,723,440 gallons. These figures are based on 802 producing springs as against 695 springs in 1908. New York, Wisconsin, Minnesota, Ohio, Massachusetts, Connecticut, California and Virginia are the largest producing States in the order given. The above figures do not include the quantities of water drunk at the springs, but do include the natural waters which were carbonated artificially, or otherwise combined and placed on the market for sale. The effect of the war in shutting out the usual supplies from Austria-Hungary and Germany was to increase the demand for American medicinal waters, so that the receipts for such waters have been larger for the last three years than before. It has been found that there are springs in America which almost exactly duplicate the analyses of famous foreign springs, and give equal satisfaction to consumers.

The majority of the commercial springs of the United States are found east of the Mississippi. In the South, Kentucky, Tennessee and Arkansas are the chief producers of mineral waters. The Hot Springs of Arkansas are among the most important thermal springs in the entire country. The Texas springs are peculiar from the fact that many of them show free sulphuric acid. In Wisconsin the springs of Waukesha are widely known. In New Mexico, the Las Vegas Hot Springs are often visited. There are no hot springs in the New England States.

Bibliography.— Goosman, J. C., ‹The Carbonic Acid Industry› (Chicago 1906); Mitchell, C. W., ‹Mineral and Aerated Waters› (London 1913); New York State Saratoga Springs Reservation Commission Report 1914, ‹Report on European Spas› (Albany 1914); Oefele, F., ‹American Balneology› (New York 1915); United States Chemistry Bureau Bulletin No. 91, ‹Mineral Waters of the United States› (Washington 1905); United States Foreign Commerce Bureau, Special Consular Reports, Vol. 14, Part 2, ‹The Mineral Water Industry› (Washington 1901); Walton, G. E., ‹The Mineral Waters of the United States and Canada› (New York 1890).

MINERAL WELLS, Tex., city in Palo Pinto County, 55 miles northwest of Fort Worth, on the Weatherford, Mineral Wells and Northwestern and the Gulf, Texas and Western railroads. The well-known mineral springs in the vicinity attract thousands of visitors and more than 1,000,000 gallons of waters are shipped annually. There are numerous drinking pavilions in and near the town, which is essentially a health and pleasure resort. Near by are places of scenic beauty, including Lake Pinto, Elmhurst Park and Lovers' Retreat. Commission government was adopted in 1913. Pop. (1920) 7,890.

MINERAL WOOL, a product of molten slag, or rock under air or steam-jet, also called slag wool, rock wool, silicate cotton, cotton fibre. The result of this process is a thin vitreous fibre, useful as a non-conductor. It was first manufactured in Germany in the early 70's. In 1875 a little was made at the Greenwood iron furnace, Orange County, N. Y.; the industry was firmly established by 1885; then because of the entry into the field of rock wool, that is, a fibre made directly from the rocks and not from slag, the slag wool industry fell off. In 1909 11,626 tons of mineral wool, valued at $101,621, was the product of the United States, a gain of more than 35 per cent over the preceding year when the product weighed 9,197 tons and was valued at $77,228. These figures included rock and slag wools; the former command a price 50 per cent higher than the latter. The slag wools have a small percentage of sulphur, unless especially desulphurized after the slag has been remelted, and thus sulphuric acid may be formed if water gets access to the wool and acts on the calcium sulphide in it. The sulphuric acid thus formed is injurious to the pipes. Hence rock wool is substituted for slag wool, or the slag wool is carefully desulphurized. Mineral wool of either sort, if of good grade, is one of the best practical non-inflammable coatings; as a lining for floors it has the double advantage of being sound-proof and non-conducting.

MINERALOGY is the science which treats of minerals and especially of the properties of these minerals, their chemical behavior and composition, their crystalline form and structure, their physical characters, their classification and their determination. Mineralogy also considers the part each mineral plays in Nature, its history, its formation and alterations, its variations under different conditions and its relation to other minerals. From a practical standpoint it records the uses of each mineral and the localities in which it has been found.

Mineralogy has many connections with other sciences, especially with crystallography and geology, for minerals are crystals for the most part and must be studied as such, and rocks are only aggregates of minerals and are identified by study of the component minerals. Physics, chemistry and mathematics are fundamental in the study of minerals and minerals are the raw material of the chemist and used by the physicist for the establishment of physical laws. Finally the arts of mining and metallurgy are concerned, the one with the extraction of minerals from the earth, the other with the extraction of metals from minerals.

Minerals are those substances of definite chemical composition which are found ready made in the crust of the earth and are not directly products of the life or decay of an organism. Usually also they will exhibit definite and characteristic molecular (crystalline) structures.

Although minerals constitute the larger portion by far of the known so-called mineral kingdom, the definition excludes certain portions. Lack of homogeneity excludes asphalt and petroleum; lack of definite chemical composition excludes the natural glasses; ice made in the factory and ruby made in the furnace are not minerals. Coral and pearl are direct products of organic life, therefore not minerals.

The fundamental requirement of definite chemical composition is sometimes apparently waived because other facts, especially proof of definite crystalline structure, have been obtained, although a satisfactory formula has not. For instance, it is not yet possible to state an unobjectionable formula for tourmaline, and the formulas of the great triclinic feldspars were long a source of confusion. The reasons are manifold, faulty analysis, impurities, replacments of one element or group by another, and sometimes, as in the so-called colloid minerals, the originally formed material has taken out other things from solutions which in the dried-out mineral remain inextricably admixed.

The characteristic crystalline structure is so frequent that minerals are sometimes defined as natural crystals. But it is now recognized that crystallinity is dependent on conditions during or preceding solidification, and that, theoretically, like any other chemical substance a mineral may, under different conditions, form in the crystalline state or the amorphous state. Not only is this theoretically true, but there are many so-called "gel" minerals which are known only in the amorphous state and other minerals which are known both in the amorphous and the crystalline state.

Historically, mineralogy as a science dates from the 18th century only. While the ancients utilized a very considerable number of minerals, some for the metals they contained, others as pigments, others as ornaments, charms and talismans and still others in medicine and the arts, they knew little as to their composition and nothing as to their molecular structure. They classified them, it is true, for there is still extant part of a work, 'On Stones,' written by Theophrastus, who died 286 B.C., while Pliny in his great work on natural history, published 77 A.D., devotes five books to "earths, metals, stones and gems."

The greatest contribution to mineralogical knowledge prior to the 18th century was made by Georg Agricola (1494–1555), professor of chemistry at Chemnitz, Saxony, who minutely discussed the known important ores, their mining, concentration and metallurgy; and may be said to have summed up and systematized the knowledge of minerals at that period.

As chemical knowledge increased the compositions of minerals were gradually determined and chemical tests began to replace arbitrary distinctions of structure, color and the like. This is clearly shown in the works of Wallerius, 1747, and Werner, 1798; and from this time the composition became the dominating character.

The existence of a characteristic crystalline structure for most minerals was very gradually recognized and, until the publication of the works of Romè de l'Isle in 1783 and Rènè Just Haüy (who "raised mineralogy to the rank of a science"), played no part in the study of minerals. From this period the fundamental importance of the crystalline structure and the part it plays in the interpretation of both physical and chemical phenomena have been everywhere recognized.

Mineralogy may conveniently be considered under the following headings: (1) Crystallography; (2) Physical Mineralogy; (3) Chemical Mineralogy; (4) Formation and Occurrence; (5) Uses; (6) Descriptive Mineralogy; (7) Determinative Mineralogy.

1. Crystallography.— Crystallography, although a distinct science, has developed with mineralogy and is so interwoven with it that the two sciences are usually taught and studied by the same specialists. Crystallography is discussed separately in the articles CRYSTALS; CRYSTALLOGRAPHY; CHEMICAL CRYSTALLOGRAPHY; and PHYSICAL CRYSTALLOGRAPHY. The subject need here be only briefly referred to in its relation to mineralogical study.

As previously stated most minerals exhibit in all or some of their occurrences a definite crystalline structure. If the mineral develops «well faced» crystals the geometric symmetry and constants are obtained by a measurement of the interfacial angles of these crystals. If however these plane-faced crystals are lacking the crystalline structure is studied by the directional characters: cleavage, behavior with polarized light, etch figures, thermal and electrical properties, etc., which yield not only characteristic constants but often the complete symmetry.

Aside from these mentioned constants and symmetry relations resulting from a study of the crystals, interesting problems arise such as the relations between composition and crystalline structure, the causes of variation in crystal habit, and the reasons for vicinal planes and parallel growths.

2. Physical Mineralogy.— Physical mineralogy considers the physical characters of minerals. Many of these are crystal characters since they vary with the direction and have therefore been discussed in the articles on CRYSTALS; CRYSTALLOGRAPHY; CLEAVAGE; and PHYSICAL CRYSTALLOGRAPHY. Other physical characters, however, which are not dependent or notably dependent on the direction the test is made, are, nevertheless, important and some of these may be described as follows:

Lustre, in the mineralogical sense, is not the degree of brilliancy, but the *kind* of brilliancy. Light reflected from different substances and quite independently of the color, produces different effects; one substance resembles a metal, another glass, another silk, and they are said to possess respectively metallic lustre, vitreous lustre and silky lustre. The determining causes appear to be transparency, structure and refractive power. The most used terms are: Metallic lustre exhibited by those opaque minerals which with the exception of the native metals have a black or nearly black powder. Non-metallic lustre exhibited by all transparent or translucent minerals, which is subdivided into vitreous, adamantine, resinous, pearly, silky and waxy according to the similarity in sheen to glass, diamond, resin, mother of pearl, silk and wax respectively.

Color, by either transmitted or reflected light, depends upon the power of the substance to absorb different proportions of the lights of different wave lengths which together make up the light used. The same substance may, therefore, appear of different colors when viewed with different sources of light; and some minerals are strikingly different as, for instance, alexandrite, which by daylight is bluish to olive green and by lamp or gas light raspberry red. Color is one of the least constant mineral characters and varies with different specimens of the same species. The variation may be due to a few hundredths of 1 per cent of some organic or inorganic substance dissolved in the mineral, or to larger amounts of mechanically included foreign material. Color effects may also be due to interference of light, usually as a result of some imperfection in the substance, or, in cut stones, from some purposely chosen shape producing notable dispersion of the white light into its component colors. Such effects are known as play of color, iridescence, opalescence, asterism, etc.

Streak, is the color of the fine powder of the mineral and is nearly constant, no matter how the color of the mass varies.

Hardness, to the mineralogist, means the resistance to abrasion of a smooth surface by a pointed fragment. It is usually, though very crudely, determined by comparison with the following scale introduced by Mohs: (1) Talc; (2) Selenite; (3) Calcite; (4) Fluorite; (5) Apatite; (6) Orthoclase; (7) Quartz; (8) Topaz; (9) Sapphire; (10) Diamond. Intermediate values are window glass 5.5; jeweler's file 6.5; zircon 7.5; chrysoberyl 8.5; carborundum 9.5. The more common procedure is to use pointed fragments of the scale minerals to scratch smooth surfaces of the mineral being tested. Sometimes this is more conveniently reversed and roughly polished plates of the scale minerals are tried by sharp edges or points of the mineral. The members of the scale are not in arithmetical ratio. The average of five attempted comparisons from 9 down give, roughly, sapphire 100, topaz 30, quartz 18, orthoclase 12, apatite 7, fluorite 3½, calcite 2½, gypsum ½. The scale, nevertheless, serves a useful purpose and no convenient substitute has yet been suggested. Elaborate tests with a diamond point, loss of weight by grinding with a standard powder, production of a crack by impact or pressure have been tried but fail to agree even approximately.

The Specific Gravity of a mineral, as of any other chemical substance, is of first rank as a test and is a function of the density of the molecule. As explained in the article CHEMICAL CRYSTALLOGRAPHY comparative molecular volumes are obtained by dividing the molecular weights by the specific gravities.

The specific gravity of a substance is defined as its weight divided by the weight of an equal volume of distilled water at 4° C. The range, in varieties of the same species, is not great and even this is principally due to actual differences in composition. The value is usually obtained by means of a delicate balance provided with attachments for weighing the substance in water, such as a small wooden bench to hold a beaker of distilled water above the scale pan, and a platinum spiral to hold the specimen. Three weighings are needed:

W = weight of the stone. S = weight of the spiral when suspended from the end of the balance frame and immersed in the distilled water. W' = weight of the stone and the spiral suspended in distilled water.

$$\text{Then, Sp. Gr.} = \frac{W}{S + W - W'}$$

Instead of absolute weighings, relative weights may be determined on a scale by the stretching of a spring as in the Jolly balance or by the distance the apparatus sinks in water, as in the hydrometer; the results are approximate.

Liquids of high specific gravity such as concentrated solutions of mercuric and potassic iodide or of silver thallium nitrate, or organic liquids like bromoform or methylene iodide, are often used for quick distinctions between similar appearing substances, one higher in specific gravity than the liquid, the other lower. They may also be conveniently used for certain exact determinations, being equally accurate for minute fragments and coarser material. A liquid is chosen which will float the material; the proper diluent is then stirred in drop by drop until a stage is reached at which the substance, if pushed down, will neither sink nor rise but stay where pushed. The specific gravity of the liquid may then be determined either roughly by dropping in fragments of material of known specific gravity until one is found which just sinks and another which floats, the liquid being of a specific gravity between these; or for more accurate determination a special balance, such as the Westphal, may be used.

Numerous other non-directional characters, some of which, such as fusibility and elasticity, are susceptible of exact determination, are approximately expressed by convenient terms. Fusibility, for instance, is determined in terms of a scale of seven minerals by comparing the effect of the blowpipe flame on small fragments of similar size. Elastic substances are distinguished as elastic and flexible. Tenacity is expressed as brittle, sectile, malleable, ductile or tough. The fracture surface is said to be conchoidal, even, uneven, splintery; and terms are used describing taste, odor and the sense of touch.

Certain characters are limited to a few minerals rather than exhibited by all. Such a character is luminescence or the property of emitting light at ordinary temperatures after being subjected to some exciting influence, such as light, friction, X-rays, ultraviolet light or radium.

3. Chemical Mineralogy.— Minerals are either elements or are formed by the uniting of atoms of different elements in definite proportions in accordance with the laws of chemistry and for either identification or classification their chemical composition is their most important characteristic.

The methods of analyses and the calculation of formulæ are in general the same as in the analyses of other definite chemical substances. Much attention has to be paid to securing homogeneous material and in general the problem is complicated by the fact that most minerals are isomorphous mixtures (or mixed crystals) rather than simple salts.

True molecular formulæ are not generally determinable. The empirical formula is calculated from the analysis. Thus, for instance, beryl:

	Percentage Composition		Atomic Weights		Proportionate Number of Groups
BeO..........	14.01	+	25	=	.56
Al_2O_3..........	19.26	+	102	=	.189
SiO_2..........	66.37	+	60	=	1.106

or closely in the ratio $3BeO.Al_2O_3.6SiO_2$ or, summing up, $Be_3Al_2(SiO_3)_6$. If the material is an isomorphous mixture, the sum of the ratios of the replaceable elements or groups is considered, for instance, in the sphalerite analysis which follows, the sum of the proportions in which Zn Fe Cd and Pb are found is 1.040 and the S 1.039.

	Percentage		Atomic Weight		Proportion		Number of Groups
S........	33.25	+	32	=	1.039		I
Zn........	50.02	+	65.4	=	.756	1.040	I
Fe........	15.44	+	56	=	.276		
Cd........	.30	+	112	=	.003		
Pb........	1.01	+	207	=	.005		

Such a composition could be expressed either by RS or (Zn.Fe.Cd.Pb)S, the letter R being used to represent a varying group of isomorphic or equivalent elements, and the parentheses with periods between the elements to show that the zinc, iron, etc., *taken together* accompany one atom of sulphur.

The question whether the water given off during heating is due to the destruction of an acid or basic salt or a hydroxide or is more loosely held as so-called water of crystallization, or is present in solid solution or is adsorbed or adhering atmospheric water, is often difficult to answer. Carefully worked-out water curves showing the loss at frequent intervals of temperature and the rate of loss at each temperature will often assist the judgment.

The chemical testing of minerals in practice is very commonly by the so-called "blowpipe tests" which possess certain advantages in speed, minute amounts of material needed and in directness of application. Usually no attempt is made to secure a complete qualitative analysis, but merely to determine the dominating constituents. Easy tests exist for most of the common and many of the rare elements, and while group separations, except for instance into volatile and non-volatile, are not practicable the order of testing is such that certain elements are detected and largely removed before the tests for the others are made.

4. The Formation and Occurrence of Minerals.— The history of a mineral, the rôle it has played, is largely told by its occurrence, associates and alterations, and these facts are often illuminated by the successful reproduction of a mineral by a method which does not conflict with the known natural conditions. The processes of mineral formation may be broadly grouped under the headings:

(1) Crystallization from a fluid magma consisting chiefly of silicates but partly of oxides, sulphides, fluorides and ferrates mutually dissolved in each other with certain volatile constituents, chiefly water. By far the greater portion of the earth's crust has formed from such magmas and a comparatively few mineral groups are found to dominate them. Clarke's estimate* is

1. The feldspars..........................	59.5	per cent.
2. The pyroxenes and amphiboles...........	16.8	" "
3. Quartz.................................	12.0	" "
4. The micas.............................	3.8	" "
5. Accessory minerals.....................	7.9	" "
	100.0	" "

The estimated 7 per cent of accessory includes rarer silicates, elements, sulphides and oxides, sometimes in quantities which are of economic value, especially when they have undergone a natural concentration known as magmatic segre-

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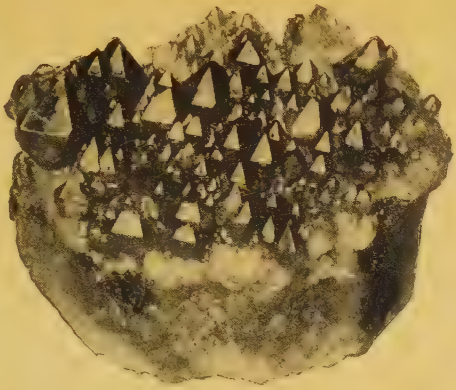
*Bulletin 491, United States Geological Survey, p. 31.

MINERALOGY



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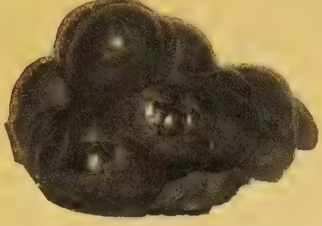

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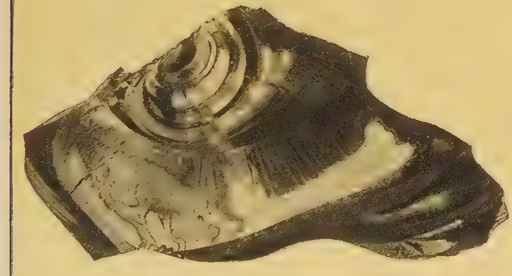

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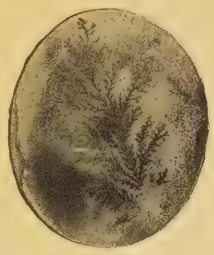

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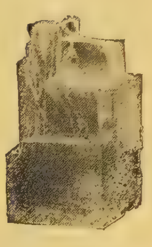

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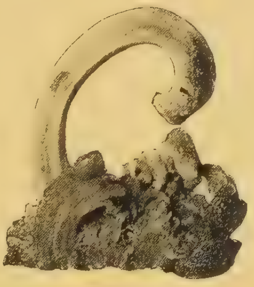

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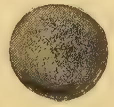

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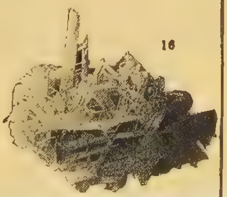

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9 Amethyst Crystals in parallel position
10 Reniform Hematite
11 Conchoidal fracture of Uintahite
12 Tree agate showing arborescent form of Wad

13 Cubical cleavage of Halite
14 Curved Gypsum
15 Star Sapphire
16 Reticulated Cerussite

gation, as in the important nickel ores of Sudbury, Canada.

(2) Formation by pneumatolysis, that is processes in which gases and vapors especially steam, hydrofluoric, boric, suphuric and hydrochloric acid play a principal part. These gases and vapors are released by the cooling magmas and when charged with dissolved matter deposit it later as new minerals in pegmatite veins, contacts, tin lodes and other places to which they may penetrate. These vapors dissolve, transport and concentrate minerals rare in the rocks which they penetrate; they form new species into the composition of which they enter and they serve as «mineralizers,» apparently with catalytic action.

(3) Crystallization or precipitation from aqueous solutions. Rain water carrying oxygen and the underground waters with dissolved carbon dioxide and other constituents are the chief agents in the disintegration and alteration of the minerals which are at or near the surface. They take away selectively much of the soda, potash and lime and much less of the magnesia and alumina and silica. The solutions due to this «weathering» are in part redeposited as cements, in part precipitated in the residual minerals, but much is carried away to rivers, lakes or oceans, and there may form deposits of new minerals, such as carbonate of lime in rivers or underground channels, salt or other minerals of soda in lakes (or if boric acid has been present borates may form) and in land-locked basins, great beds of anhydrite, gypsum and common salt, or, more rarely, as at Stassfurt, salts of potassum and magnesium.

The minerals of veins by their composition and arrangement are shown to be deposits from watery solution, but in most cases not simply solutions of the neighboring rocks in the underground water, but also solutions in the vapors of deep-seated magmas. As the vapors rise into regions of lower pressure and temperature condensation takes place, fluid solutions form, various species separate and are deposited on the walls and may ultimately fill the fissure, forming a vein.

Animal and vegetable organisms often assist in the formation of minerals from watery solutions. The original deposits may not always be strictly mineral species as with coral, shells, diatomaceous earth, but directly or indirectly true species often result, such as limonite, apatite, sulphur and soda nitre. The formation of a mineral may involve very complex agencies such as the combined action of intense pressure from rock folding and of circulating waters often hot and charged with many constituents, including the so-called mineralizing agents. The new minerals are often denser than the originals and many contain constitutional water.

5. The Uses of Minerals.— The mineral industry of this country ranks next to the agricultural, and the value of the minerals considerably exceeds $2,000,000,000 a year. While the principal value of these minerals is for the extraction of particular constituents such as the metals or the substances of use in the chemical industries, there is a large use of the minerals in their natural state not only as constituents of building stones, but as abrasives, fertilizers, fluxes, pigments, refractory materials and in the making of pottery, porcelain, glass, etc. Minerals susceptible of polish and with any claim to beauty are utilized as precious or ornamental stones.

Minerals are the raw material from which all the metals and all the chemical salts except the organic compounds are made. Not all minerals containing a desired element are utilized, and generally only one or two materials are obtained *directly* from a mineral. These products are themselves used for the manufacture of others, as for instance the mineral halite or common salt is the indirect source of nearly all of the sodium salts, but is the direct source principally of a crude sodium sulphate from which a multitude of other salts are manufactured.

6. Descriptive Mineralogy.— It may be said that it is the province of descriptive mineralogy to sum up all the results of the study of minerals, as already outlined, into orderly form for each mineral species and to so classify the different species that related minerals shall be grouped together.

The basis of classification may be scientific, or economic or genetic; each for certain purposes being the most satisfactory. Classifications until the 18th century were based on distinctions of structure, color, use, or some fancied similarity, and as has been said were «chiefly designed to enable amateurs to arrange their collections in a fixed order.» Pliny the naturalist (23–79 A.D.) classified as metals earths, stones and gems. Avicenna nearly 1,000 years later used a very similar classification with many subdivisions based on either external characteristics or easily ascertained properties.

Scientific classifications based on essential characters began as the increased chemical knowledge brought composition and chemical tests to the front. This was instanced in the systems of Wallerius in 1747 and Werner in 1798. The still later realization that most minerals possessed a characteristic molecular structure revealed by its crystals and physical characters followed naturally the discoveries of de l'Isle, Haüy and others of the laws governing crystals; and the methods of examining crystals placed crystalline structure alongside chemical composition as the bases of natural scientific classification. The system of James D. Dana is probably most used throughout the world and «follows first the chemical composition and second the crystallographic and other physical characters which indicate more or less clearly the relations of individual species.» Eight principal divisions are made from a chemical standpoint as follows:

I. *Native Elements.*
II. *Sulphides, Selenides, Tellurides, Arsenides, Antimonides.*
III. Sulpho-salts.— *Sulpharsenites, Sulphantimonites, Sulphobismuthites.*
IV. Haloids.— *Chlorides, Bromides, Iodides, Fluorides.*
V. *Oxides.*
VI. Oxygen Salts.
    1. *Carbonates.* 2. *Silicates, Titanates.* 3. *Niobates, Tantalates.* 4. *Phosphates, Arsenates, Vanadates, Antimonates, Nitrates.* 5. *Borates, Uranates.* 6. *Sulphates, Chromates, Tellurates.* 7. *Tungstates, Molybdates.*
VII. Salts of Organic Acids.— *Oxalates, Mellates, etc.*
VIII. *Hydrocarbon Compounds.*

In subdividing, the chemical composition and crystalline form are considered with the purpose of assembling in groups those minerals which have analogous compositions and closely similar forms. For instance the barite group under anhydrous sulphates consists of sulphates in which Ba, Ca, Sr and Zn are in the same Mendeléeff group, and which show close similarity in crystal constants.

	$\breve{a}$	b	c′
Barite $BaSO_4$	0.8152	1	1.3136
Celestite $SrSO_4$	0.7790	1	1.2801
Anglesite $PbSO_4$	0.7852	1	1.2894
Anhydrite $CaSO_4$	0.8933	1	1.0008
Zinkosite $ZnSO_4$	0.8925	1	1.4137
Hydrocyanite $CuSO_4$	0.7971	1	1.1300

Descriptive mineralogy also serves to keep in order the nomenclature. Uniformity can only be obtained if after careful consideration the term entitled to priority and otherwise satisfactory is made the name of the species and the host of synonyms and often unessential variety names assembled under it.

7. Determinative Mineralogy.— This subject has already been discussed in a separate article. See Determinative Mineralogy.

Bibliography.— The following is a partial list of comparatively recent works and may be supplemented by the lists following the articles on Crystals and Crystallography.

Treatises, Mineralogy.— Dana, J. D., ‘System of Mineralogy’ (6th ed., with three appendices, 1899, 1909 and 1915, New York 1892); Hintze, Carl, ‘Handbuch der Mineralogie’ (Bd. I, 1904; Bd. II, 1897, Leipzig; still incomplete).

Textbooks, Mineralogy.—Bauer, M., ‘Lehrbuch der Mineralogie’ (2d ed., Stuttgart 1904); Dana-Ford, ‘Manual of Mineralogy’ (13th ed., New York 1912); Dana, E. S., ‘A Textbook of Mineralogy’ (New York 1907); Moses, A. J., and Parsons, C. L., ‘Mineralogy, Crystallography and Blowpipe Analysis’ (5th ed., New York 1916); Miers, H. A., ‘Mineralogy. An Introduction to the Scientific Study of Minerals’ (London 1902); Naumann-Zirkel, ‘Elemente der Mineralogie’ (13th ed., Leipzig 1898).; Phillips, A. H., ‘Mineralogy’ (New York 1912); Rogers, A. F., ‘Introduction to the Study of Minerals’ (New York 1912); Tschermak, G., ‘Lehrbuch der Mineralogie’ (6th ed., 1905).

Determinative Mineralogy and Blowpipe Analysis.— Brush-Penfield, ‘Manual of Determinative Mineralogy’ (16th ed., New York 1906); Eakle, A. S., ‘Mineral Tables’ (New York 1904); Fuchs-Brauns, ‘Anleitung zum Bestimmen der Mineralien’ (6th ed., Giessen 1913); Frazer-Brown, ‘Tables for the Determination of Minerals’ (6th ed., Philadelphia 1910); Kraus-Hunt, ‘Tables for the Determination of Minerals’ (New York 1911); Lewis, J. V., ‘Determinative Mineralogy’ (2d ed., New York 1915); Plattner-Kolbeck, ‘Probierkunst mit der Lötrohre’ (7th ed., Leipzig 1907).

Chemical Mineralogy.— Brauns, R., ‘Chemische Mineralogie’ (Leipzig 1896); Doelter, C., ‘Physikalische-Chemische Mineralogie’ (Leipzig 1905); Doelter, C., ‘Handbuch der Mineral Chemie’ (Bd. I, II, III, Dresden 1912–13).

Occurrence, Association and Origin of Minerals.— Beyschlag-Krusch-Vogt (trans. by S. J. Truscott), ‘The Deposits of the Useful Minerals and Rocks’ (Vol. I, 1914; Vol. II, 1916; Vol. III, London); Clarke, F. W., ‘The Data of Geochemistry’ (Bulletin No. 660, United States Geological Survey, 1915); Leith and Meade, ‘Metamorphic Geology’ (New York 1915); Lindgren, W., ‘Mineral Deposits’ (New York 1913); Pirrson, L. V., ‘Rocks and Rock Minerals’ (New York 1908); Van Hise, C. R., ‘A Treatise on Metamorphism’ (Monograph 47, United States Geological Survey, 1904); Weinschenck, E., ‘Grundzüge der Gesteinkünde’ (Freiburg im Briesgau 1905).

Rock Minerals and their Microscopic Examination.— Daly, R. A., ‘Igneous Rocks and their Origin’ (New York 1914); Iddings, J. P., ‘Rock Minerals’ (2d ed., New York 1912); Johannsen, A., ‘Determination of Rock Forming Minerals’ (New York 1908); Johannsen, A., ‘Manual of Petrographic Methods’ (New York 1914); Luquer, L. McI., ‘Minerals in Rock Sections’ (4th ed., New York 1913); Weinschenck-Clark, ‘Petrographic Methods’ (New York 1912); Wright, F. E., ‘The Methods of Petrographic-Microscopic Research’ (Carnegie Institution 1911).

Microscopic Study of Minerals.— Murdoch, J., ‘Microscopical Determination of the Opaque Minerals’ (New York 1916); Schroeder van der Kolk, J. L. C., ‘Tabellen zur mikroskopischen Bestimmung der mineralien nach ihren Brechnungsexponenten’ (2d ed., Wiesbaden 1906); Seeman, F., ‘Leitfaden der Mineralogischen Bodenanalyse’ (1914); Winchell-Winchell, ‘Elements of Optical Mineralogy’ (New York 1908).

Rare Minerals.— Cahen and Wootten, ‘The Mineralogy of the Rarer Metals’ (Philadelphia 1912).

Gems and Precious Stones.— Bauer, Max, ‘Edelsteinkunde’ (2d ed., Leipzig); Cattelle, W. R., ‘Precious Stones’ (Philadelphia 1903); Crookes, Sir Wm., ‘Diamonds’ (New York 1909); Escard, J., ‘Les Pierres Précieuses’ (Paris 1914); Farrington, O. C., ‘Gems and Gem Minerals’ (Chicago 1903); Eppler, A., ‘Die Schmuck und Edelsteine’ (Stuttgart 1912); Smith, G. F. H., ‘Gem Stones’ (New York 1912).

The Uses of Minerals.— Dammer und Tietze, ‘Die Nutzbaren Mineralien’ (2 vols., Stuttgart 1913); ‘Mineral Resources of the United States’ (Annually since 1883. U. S. Geol. Survey); ‘The Mineral Industry’ (Annually since 1892. New York); *Engineering and Mining Journal*, especially Annual Review number.

History of Mineralogy.— Fletcher, L., ‘Guide to Mineral Collection of British Museum’; v. Kobell, F., Geschichte der Mineralogie’ (München 1864).

Mineral Synonyms.— Chester, A. H., ‘Dictionary of the Names of Minerals’ (New York 1896).

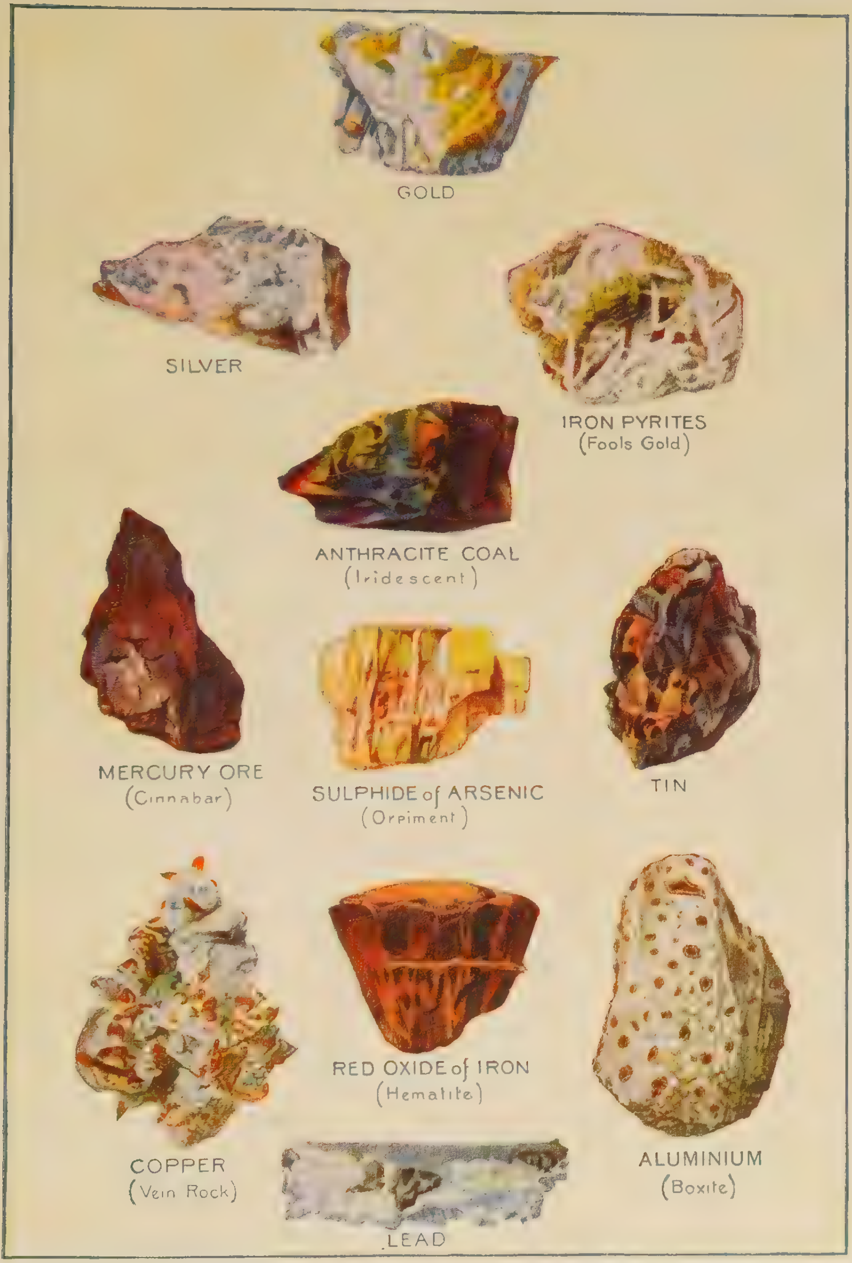
Alfred J. Moses,
Professor of Mineralogy, Columbia University.

MINERS, Western Federation of. See Western Federation of Miners.

MINERS' ANÆMIA. See Hookworm Disease.

MINERS' INCH. See Hydrology.

MINERS MILLS, Pa., borough in Luzerne County, three miles northeast of Wilkes-barre, on the New Jersey Central, the Delaware and Hudson and the Lehigh Valley railroads. The chief industry is coal mining. The town contains a flour mill, a brick plant and ironworks. Pop. 3,159.



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VALUABLE MINERALS AS THEY ARE FOUND

MINERSVILLE, Pa., borough, in Schuylkill County, on the west branch of the Schuylkill River, and on the Philadelphia and Reading and the Lehigh Valley railroad, about 45 miles north by east of Harrisburg. Situated in the hard coal region, its chief industries are connected with mining and shipping coal. Industrial establishments include machine shops, foundries, underwear factories, lumber and brick yards. Pop. 7,500.

MINERVA, mĭ-nėr'va, from the Greek *μέγος, menos,* spirit, strength, typifying The Thinker,— Goddess of Wisdom — and applied to Pallas Athena, signifying Maid of Athens, a Greek divinity, in earlier times worshiped as Ergane, the goddess of crafts, and Nike, the goddess of battles. Her statues called Palladina (often said to be gifts or windfalls from Heaven) were sternly guarded in the city temples as ensuring the citadel's impregnability. Her greatest shrine, the Parthenon — from *parthenos,* virgin,— the «Temple of the Virgin» at Athens, graced with the gold ivory statue by Phidias, was the highest achievement of Greek architecture. Minerva was perpetuated in Roman mythology, as a daughter of Jupiter, and one of the great divinities. She was looked upon as the patroness of all Roman arts and trades, and her annual festival, called Quinquatrus, celebrated throughout Etruria, lasted from the 19th to the 23d of March, inclusive. Consult Fairbanks, A., 'The Mythology of Greece and Rome' (New York 1907) and 'Handbook of Greek Religion' (New York 1910); Fowler, W. W., 'Roman Festivals' (London 1899).

MINERVINO MURGE, Italy (Lucus Minervæ), a walled town in Apulia, 43 miles west of Bari. Fruits, vegetables and oil are produced here. There are also large quarries and limekilns. Pop. 19,325.

MINES, Drainage of. See MINING.

MINES, Submarine. See SUBMARINE MINES.

MINES AND MINING, Law of. See MINING LAWS OF THE UNITED STATES.

MINES AND MINING, Military. In all periods of the history of warfare, particularly in siege operations and the somewhat similar operations in trench warfare, recourse has been had to the use and construction of subterranean passages, either as a means of penetrating the lines of the enemy, or to avoid a dangerous advance under fire at the surface, or for the destruction of a hostile position by the use of explosives, or to prevent on the part of the enemy undertakings such as those already described. These operations constitute military mining, and the charge of explosives set off under a position of the enemy is known as a mine. While any of the devices and methods employed in commercial mining may be used in appropriate military situations, military mining is dominated by the consideration of simplicity — for complicated tools cannot be brought up to the battle-line — speed and inconspicuousness. In addition, by far the greater part of the work is done in soil which is sufficiently soft to present relatively little difficulty to excavation, but which manifests a constant tendency to cave in. This tendency is accentuated by the continual disturbance of the soil by artillery fire and the countermines of the enemy. Accordingly the reinforcement of the walls of his excavation is generally among the chief problems of the military miner. The methods used are much the same, whether the excavation is a vertical shaft or an approximately horizontal gallery. They fall into two general classes. In one casings are inserted as the work progresses. These consist of four lengths of stout planking surrounding the excavation. Two opposite lengths are provided with mortises and the other two with tenons. In the other type of mining, longitudinal planks known as sheathing are held in place by frames of strong timber.

Galleries are divided into great or grand galleries (6 feet high by 3½ feet); half galleries (4½ feet by 3 feet); branches (3½ feet by 2½ feet); and small branches (2½ feet by 2 feet). The smaller galleries are often excavated by earth augers; the larger ones by ordinary excavating tools reduced in size so as to be adapted to use in a confined space. An especial digging tool known as the push-pick is also employed. The direction of galleries is determined by the ordinary surveying instruments used on the surface, due allowance being made for the unreliability of the compass under ground. The targets are of course slits through which an artificial light shines. The azimuth is transferred from the top to the bottom of a shaft by means of a pair of plumb-lines, which are oriented by compass and map above ground. Ventilation is essential, and is secured by various mechanical means, or in a system of galleries with two or more outlets, by a fire near the upper end of a shaft. In difficult places, air may be pumped in by a hose. Respirators may be worn in case of emergency. Drainage is secured by sloping the floors of the galleries and supplying them with gutters. If it is not possible to make all the galleries slope toward the entrance, a sump is dug from which the water is pumped or carried in buckets. The lighting of galleries is often a difficult problem, on account of the nearness of explosives and the difficulties of ventilation. Electric lights are often used. Where it is possible, daylight is reflected into the gallery by mirrors or white surfaces, and the walls are whitewashed. The disposal of the excavated earth is often a difficult problem. It is usually taken away in sacks or relays of wheelbarrows. Sometimes small narrow gauge railways have been used.

The mine chamber is nearly cubical or of the shape of a cylinder with an altitude twice its radius. It is often simply the end of a gallery or shaft. The charge is usually some high explosive such as dynamite or trinitrotoluol. It is set off by a detonator and primer, usually fired by electricity, though a powder fuse may be used. The charge is tamped by obliterating from 6 to 10 feet of the passage leading up to the chamber.

The explosion of a mine produces a compression of the surrounding soil which will blow in any gallery within a certain radius. It also causes a pit or crater to be excavated in the surrounding soil, provided the chamber is sufficiently near the surface. A mine which does not break the surface is known as a camouflet. In a normal mine, the depth of the charge beneath the surface is equal to the radius of the crater at the surface of the ground.

Mines dug from the surface are known as land mines, or if the crater is filled with stones, etc., so as to form a crude mortar, as fougasses. Land mines are only permissible in ground obviously prepared for defense. They may be set off by devices under the control of some operator, or automatically by triggers or other such means.

The tactics of mining depend on the opposition of mines by counter-mines. It is always necessary to supplement one's own effort to attain his objective by an effort to frustrate the plans of the enemy. The only way by which reliable information of the progress of the enemy can be attained is by listening either directly, or with the aid of microphones. Men are trained for this purpose, and stationed in galleries called listeners, placed sufficiently near to one another to prevent a hostile gallery from being pushed between them without being heard.

It is generally better in mining operations to come into actual contact with the counter-mines than to fire too soon. The best place to attack a hostile gallery is from the side, as then a greater length of gallery is destroyed.

Mines are sometimes used to form craters to take the place of trenches in an advance. A row of such craters serves not only as a parallel on the surface but as a starting-point for new mines.

Galleries are usually started as near the hostile lines as possible, i.e., from advanced saps. In fortresses concrete lined permanent galleries often serve as a beginning for counter-mine galleries in case of siege. Consult 'Engineer Field Manual' (Washington 1912).

MINETTE, an igneous rock belonging to the syenite group, of granular texture and composed essentially of feldspar and biotite. It occurs in dykes.

MINGHETTI, min-gĕt-tē, **Marco,** Italian statesman and writer; b. Bologna, Italy, 8 Nov. 1818; d. Rome, 10 Dec. 1886. He came of a wealthy family and was given a university education. After studying the political institutions of France, Great Britain and Germany, he returned to Italy and published an essay on the commercial advantages of free trade as existing in England, espousing the economic views of Richard Cobden, which were similar to the teachings of the Tuscan economist, Bandini, already adopted by him. Minghetti began his public career in 1846 by establishing a liberal journal, *Il Felsineo,* in Bologna. In 1847 he was called to Rome by Pius IX to become a member of the Consulta delle Finanze and in 1848 he became Minister of Public Works. When the Pope yielded to Austria, Minghetti transferred his services to Sardinia, joining the army under Charles Albert in Lombardy. He was appointed on the royal staff with the rank of captain. After the battle of Goito, he was made major and distinguished himself in the engagement of Custozza (25 July 1848). Invited to Rome by Count Rossi as a member of the new constitutional ministry, he arrived the day of Rossi's assassination. He refused the Pope's request to take Rossi's place and returned to the Piedmontese army. After the defeat at Novara (1849), Minghetti lived quietly in Milan for several years, devoting himself to political economy. In 1859 he became Cavour's Secretary of State for Foreign Affairs. On Cavour's death in 1861 he was regarded as the ablest representative in the Italian Chamber. In 1863 he became Prime Minister and in 1864 he concluded with Napoleon III the «September Convention,» which seemed to place an obstacle in the way of completing Italian unity. He left office in 1864. In 1868 he was Ambassador to London. For a short time, subsequently, he was at the head of the Agricultural and Commercial Department of the Menabrea Ministry (1869). He was Ambassador to Vienna in 1870–73; and from 1873 to 1876 again head of the Cabinet, first as Minister of Finance and then as Minister of Foreign Affairs. His last years were spent in partial retirement and study. Minghetti's writings include 'Della economia publica e delle sue attinenze con la morale e col diritto' (1859); 'Lo Chiesa e lo Stato' (Milan 1878); 'Opuscola letterari ed economici' (1872); and 'Discorsi parlamentari' (Rome 1888–90). Minghetti was also a student of the fine arts, lectured on Dante and Raphael and wrote a book, 'Le donne italiane nelle belle arte al secolo XV e XVI' (1877) and a biography of Raphael (1885). His autobiography, 'I miei recordi,' appeared after his death (1888).

MINGO JUNCTION, Ohio, city in Jefferson County, 12 miles northeast of Urbana and 50 miles south of Youngstown, on the Pennsylvania, the Pittsburgh, Cincinnati, Chicago and Saint Louis and the Wheeling and Lake Erie railroads. The Carnegie steel works are situated here. Farming, dairy-produce and fruit-growing are the chief industries. Coal is found in the vicinity. The place was settled about 1800. Pop. 4,616.

MINGRELIA, a region bordering on the Black Sea and situated in the Caucasus, a former province of Transcaucasia. It is now included in the Russian state of Kutais. Long a vassal state of Georgia, it became in 1414 independent under its own princes, although tributary to Turkey and Persia. Mingrelia passed under Russian control in 1803 but the administration was left in control of native chiefs until 1867. Then, as a result of peasant uprisings, begun in 1857, Russia annexed it. The population is now about 250,000. In ancient times the district was known as Colchis, famous in Greek mythology as the home of Medea and the Golden Fleece, the goal of the Argonauts. To the Greeks the province was famous as the seat of Dioscurias, a colony of Miletus, noted for its wines and fruits. Colchis was subject to Persia; to Mithridates, king of Pontus; and ultimately came under the rule of the Roman Empire.

MINGRELIANS, inhabitants of Mingrelia, now in the Kutais region of the Caucasus. Of the Georgian group they are above the average in height and many of them, like the Georgians proper, possess much physical beauty. Their language varies considerably from the Georgian stock. They have a folk-literature, consisting of legends and songs and folk-music and dances. Many of this tribe are Christian. Their national character is not admirable. «All trace of the names of Colchians, Iberians and Albanians has long since passed away,» writes James Bryce in 'Transcaucasia and Ararat' (London 1896), «and though Mingrelians now live where Jason found the Colchians, there is nothing to show that any of the blood of Æëtes and Medea flows in their degenerate veins, though the names of the Greek hero and his formidable bride are used to-day as Christian names in the country. We find the Mingrelians along the Black Sea coast from the Turkish border to Sukhum Kaleh. They are the ne'er-do-wells of the Caucasian family. All their neighbors, however backward a Westerner may think them, have a bad word and a kick for the more backward Mingrelian. To believe them, he is lazy, sensual, treacherous and stupid, a liar and a thief. Lazy, the Mingrelian certainly is; and he lives in so damp and warm a climate that violent exercise must be disagreeable. He is a well-made, good-looking fellow, but with a dull and, perhaps, rather sensual expression. And he is certainly backward in agriculture and trade, making very little of a singularly rich country.»

MINIATURE PAINTING (from the Latin *minium,* «red lead»), a painting on a very small scale. The art has its origin in the practice of embellishing books, in which the principal pigment used was red lead. Hence the Low Latin verb «miniare,» to color with red lead, was applied to the art, and those who practised it came to be known as «miniatori.» (See MANUSCRIPTS, ILLUMINATED). The exact date of the introduction of portraits into these embellishments is difficult to ascertain. However, such tiny likenesses gained great favor, often engaging the effort of great artists; and eventually the word «miniature» took on a new meaning, and was applied to very small portrait paintings exclusively.

The early artists painted on vellum, and used body-colors, i.e., colors mixed with white or other opaque pigments and this was continued until the 17th century when thin leaves of ivory fixed on cardboard with gum were substituted. The ivory was adapted naturally to richer and more varied coloring, and transparent colors were employed on faces and hands, while opaque colors were used for other textures. From the use of miniatures on various articles such as snuff boxes, card-cases, etc., enamel came into popular favor also.

Of the earliest painters of portrait miniatures, Holbein (the younger) stands foremost in excellence. The miniatures ascribed to him are characterized by the same perfection which mark his larger portraits. He was followed in England by Nicholas Hilliard, who was the first to develop painting in miniature as an art *per se.* He flourished about 1547–1619, and painted chiefly on vellum. His productions show a marked adherence to manuscript form — the colors used are opaque, while gold is used for background and ornamentation. His son Lawrence improved in coloring. Isaac Oliver (about 1567–1617), his contemporary, produced some excellent work, but the best English work of the 17th century was done by Samuel Cooper (1609–72). His work is not limited by the size of his canvas, and in breadth and dignity shows the master hand. Other well-known English miniaturists were Richard Cosway (1741–1821) who produced exquisite effects on ivory and vellum; George Engleheart (1750–1829); Andrew Plimer (1763–1837); John Smart (1741–1811), who displays a fine treatment of texture; and Andrew Robertson (1777–1845) and Sir William Ross, who developed the so-called larger miniatures. The revival in the 19th century brought others to the foreground.

In Germany, some of the great artists painted an occasional miniature, notably Lucas Cranach the Elder. German and Austrian miniaturists are best represented by Ismael Mengs (1688–1764), Sophie Friederike Dinglinger (1736–91), Martin van Meytens, a Swede who executed his principal work at Vienna (1695–1770), and Heinrich Friedrich Füger (1751–1818). The 19th century revival found an able exponent in E. Bastanier at Berlin.

Italy, the home of the miniature in its original meaning, produced comparatively few portrait miniaturists of note. Guilio Clovio, in the Renaissance period, executed charming little portraits, rich in color and vigorous and clear in their drawing. Rosalba Carrera, the 17th century painter of pastels and a native of Venice, painted imaginative delicate miniatures which have few equals.

France produced numerous prominent artists in this field, especially in the 18th century. The art is said to have been introduced by Jean Clouet in the early 16th century. One of the earliest exponents of the art was Klingstet, a native of Riga, who practised in France, but he pandered too much to the decadent taste of the 18th century society to produce works of lasting value. His portraits, however, are estimable creations. Massé also flourished at this period, his notable contemporaries being Tibaldi, Sartori, Camerata, Lainé and Jean Gros. Under the sovereignty of Marie Antoinette, the art of the miniature reached its height and was promulgated by prominent artists: Vincent, La Chausseé, Mausson, Mosnier, Villers; and, greatest of all, the Swede, Hall (1783–93). The extreme finesse and vigor with which he subordinated details to the general effect won for him the title of «the Van Dyck of Miniature.» Siccardi and Fragonard continued in his style, increasing the breadth of treatment. Dumont, Isabey, Augustin and Duchesne carried the art to a high point of perfection, during the days of the Directory and the Empire. Their portraits of Napoleon and his court are fine and spirited examples. In enamel work, excellent miniatures were produced by Petitot (1607–91) for Louis XIV. His son carried on his work.

In Spain the painter Goya executed some fine miniatures. Hans Bol (1543–93) in Holland gained considerable reputation.

The United States is best represented in this field by the portrait painters, Copley, Gilbert Stuart and Peale. Malbone (1777–1807), however, was the first great American miniaturist. His portraits show warmth and depth, and by their excellence placed American miniature on an equal footing with those of foreign contemporary artists. Fraser, his contemporary, Miles and George Freeman also deserve mention.

The introduction of photography greatly lessened the demand for small portraits and the life of the art of miniature was threatened. However, it was not long before the superior artistic merit of the little paintings began to awaken a new interest in discriminating persons, and an important revival of the art took place in the latter part of the 19th century. Miniature still flourishes, although the popular demand has relegated it to a comparatively minor place.

Of miniature collections one of the very finest is that of J. P. Morgan (Metropolitan Museum of Art, New York). Excellent collections are in the possession of the king of England, the queen of Holland and also at the Louvre, Amsterdam, Berlin, Petrograd, Vienna, Florence, Stockholm and Helsingfors. Private collections of fine quality belong to notable families in England.

Bibliography.—Ferrand, ‹Traité de peinture en email et en miniature› (Paris 1732); Mayol, ‹Introduction à la miniature› (Paris 1771); ‹Ecole de miniature› (Leipzig 1776); Propert, J. L., ‹History of Miniature Art› (London 1887); Bradley, J. W., ‹Dictionary of Miniaturists, Calligraphers and Copyists, From the Establishment of Christianity to the 18th Century› (London 1887–89); Williamson, ‹Portrait Miniatures from the Time of Holbein 1531, to that of William Ross, 1860› (London 1897); Wharton, A. H., ‹Heirlooms in Miniatures› (Philadelphia 1898); Foster, J. J., ‹Miniature Painters, British and Foreign,› and ‹British Miniature Painters and Their Works› (New York 1903); Leichsing, ‹Die Sildnis Muniaturmalerei in Österreich› (Vienna 1905); Heath, D., ‹Miniatures› (London 1908); Faust, C., ‹Les Miniatures de l'Empire et de la Restauration› (Paris 1913). Consult also the catalogues of the various collections.

MINIÉ, mee-nee-ay, **Claude Etienne**, French soldier and inventor: b. Paris, 1814; d. 1879. He enlisted in the army as a private when very young and left as a colonel in 1858. He devoted himself to the perfecting of fire-arms and in 1849 invented the Minié rifle and bullet. In 1858 the Khedive of Egypt appointed him director of a small arms factory and musketry school in Cairo.

MINIMITES (*Fratres minimi*, «least brethren»), a Catholic religious order founded by Saint Francis of Paula (1416–1507). Having become a Franciscan monk Saint Francis went into retreat near Paula, where he was joined by devout companions and, their number increasing, a community life was begun in 1454, when a large monastery and church were built. The rule of life was of extraordinary severity. To express the character of extreme poverty and humility Saint Francis eventually obtained from the Holy See permission to call his order, Minims, «the least of all religious bodies.» In 1474 Sixtus IV confirmed the order which was first known by the title Hermits of Saint Francis. Alexander VI changed it to Minims. Their first definite rule was drawn up by Saint Francis in 1493. It was so austere that all animal products, including butter, cheese, milk and eggs were forbidden, as well as meat. At one time the order numbered 450 monasteries and convents, but to-day only a few remain in Italy. Saint Francis also founded an order for nuns, which never had more than 14 convents, and a third order for persons living in the world. Louis XI summoned Saint Francis to France; and in Paris the order was known as «Bons Hommes,» from the fact that it succeeded an older monastery of that name in Vincennes. In Spain the order was called Fathers of Victory, because the recovery of Malaga from the Moors was attributed to their prayers. The Emperor Maximilian called the Minims to Germany in 1497. Consult d'Attichy, ‹Histoire générale de l'ordre sacré de Minimes› (2 vols., 1824); Butler, ‹Lives of the Saints› (1798–1800).

MINIMUM DUTIES. See DUTY.

MINIMUM THERMOMETER. See THERMOMETER.

MINIMUM WAGE, the lowest reward that legislature considers just payment to laborers for their regular work. It is a wage, not only commensurate with the bare cost of living, but, so far as reasonably possible, to supply to every worker the means of procuring health, comfort and happiness in the broadest sense of those words. The minimum is difficult to determine because the cost of food, housing, fuel and clothing differs in different countries and States. Investigations of the conditions of living have to be taken into consideration before the sum can be determined. The minimum wage movement may be defined as a concerted effort on the part of social reformers and workers to wrest from capitalists a fair sum for the workers employed by them. The statutory minimum wage movement is a modern idea. It first appeared in Belgium in 1887 in the form of a minimum wage statute for laborers employed in public work. The first legislative minimum wage applying to private employment was adopted in Victoria, Australia, in 1896, and was soon followed by similar statutes in other Australian provinces and in New Zealand. It has also been in force in England since January 1910. These acts were applied to both male and female laborers. The adoption of a minimum wage in this country, beginning with the Massachusetts act of 1912, was borrowed, as was other labor legislation, from England. See LABOR; WAGES.

MINING. Mining is a basic industry, the magnitude of which is indicated by the 6,000,000 men employed in the various mines in the world. Of this number about 3,800,000 men are engaged in coal mining and 2,200,000 in other mining. In addition millions are employed in the allied industries, such as the manufacture of iron and steel, copper wares, coke and chemicals, all of which are directly based upon the mining industry. The mines and quarries of the United States in 1917 employed over 1,127,000 men segregated as follows: Coal mines, 757,000; metal mines and metallurgical works, 280,000; quarries, 90,000.

Geographic Distribution.— The mining industry of the United States is roughly geographically distributed as follows: The anthracite coal mines are in northeastern Pennsylvania the bituminous coal mines occupy the western slope of the Appalachian Mountain system from northern Pennsylvania to northern Tennessee, with a large coal field in the vicinity of Birmingham, Ala. The central coal field occupies central and southern Illinois, southwestern Indiana and western Kentucky. The coal fields west of the Mississippi River include southern Iowa, northern and western Missouri, southeastern Kansas and northeastern Oklahoma, with large bituminous and lignite fields in Texas. The coal fields of the Rocky Mountain States are scattered with the principal fields in southern Wyoming, northern Wyoming, western Montana and northeastern

New Mexico and southeastern Colorado. The Pacific Coast States coal fields occupy the northwestern part of Washington with a small area in western Oregon and a small field in California. Alaska has coal fields in the southern portion which are of considerable importance, although not well developed. The United States is the greatest producer of coal, and in normal times the yield is 38 per cent, Great Britain 22 per cent and Germany 20 per cent of the world's output of coal. The metal-mining industry of the United States is distributed approximately as follows: The principal iron mines are in Minnesota, Michigan, northern Wisconsin, northeastern New York and central Alabama. The principal copper mines occur in northern Michigan, western Montana, Utah, Nevada, Arizona and southern Alaska. The lead mines are in southeastern Missouri, the Cœur d'Alene district, Idaho, and in Colorado. The principal zinc mines occur in southwestern Missouri and eastern Oklahoma; Leadville, Colo., and Butte, Mont., are becoming large producers. The gold and silver mines occur in Alaska, California, Colorado and Nevada, while every Rocky Mountain and Coast Range State produces more or less of the precious metals. Phosphate rock occurs in large quantities in Tennessee, Florida and South Carolina; bauxite in Arkansas and Georgia; salt in New York, Michigan and Kansas; petroleum and natural gas in Oklahoma, Texas, California, Pennsylvania, Ohio, West Virginia and Indiana.

The United States is the world's largest producer of copper, iron, lead, zinc and petroleum. About 20 per cent of the world's gold supply comes from the United States; 40 per cent from South Africa and 15 per cent from Australasia. (See article on GOLD MINING). The Central Powers of Europe produce only 0.6 per cent, while the United States and her allies produce 91.3 per cent, and neutrals (1918) produce 8.1 per cent.

Prospecting.— Preliminary work in mining operations is known as prospecting, and is often conducted by individuals who work on their own account, spending weeks or months in outlying districts in search of mineral outcrops or rock indicating that valuable minerals may be present. The prospector of the early days is fast disappearing and prospecting is now carried on in a scientific way by large development or exploration companies, whereby a promising mineral field is thoroughly tested by churn drills or core drills as economy may suggest. The core or diamond drill is most important in this particular work in that it obtains a core so that it is possible to know accurately the formation through which the drill has passed together with its thickness, depth and mineral content. The ground is marked out in squares of 100 to 500 feet on a side and at the corners or in the centre of each square a drill hole is sunk, and the core or cutting thoroughly tested. This work is carried on in conjunction with geological studies, in which the character of the various country rock is studied, as, for example, its position and composition, lithological character and other data which may be of interest to the prospector and geologist, and help to point out the places where ore deposits are most likely to occur. Trenches are often cut across mineral zones, and small shafts sunk to test the character and quality of the mineral.

Development.—After a property has been prospected and it is definitely known that it contains mineral deposits of economic importance the development proper begins by the construction of shafts, entries or slopes, and the blocking out of the ore or coal which is to be taken out at a later date. This work is usually done preliminary to the building of a mill or other reduction works.

Drainage.— In the development of mines one of the important factors to be taken into consideration is the matter of drainage and ventilation. Of course drill holes and preliminary shafts indicate to a certain extent the amount of water that will be encountered, but as the mine workings are extended larger areas are opened for the entrance of ground waters, thus increasing the amount of water which in the small mines would be considered negligible. When a mine is opened on a hillside, the drainage is usually taken care of by an adit and all of the mine workings drained from the lowest level, the upper workings in this case being absolutely without water. Where a mine cannot be thus drained, it is necessary to install large and expensive pumping plants, as frequently the amount of water handled is far in excess of the coal or ore produced.

Ventilation.— The ventilation of mines is also an important item to be considered, especially when mines are opened to a considerable depth. The ventilation of coal mines has been well worked out in the anthracite and bituminous fields by reason of the fact that many of the mines generate noxious or poisonous gases, making it impossible to work without adequate ventilation. The metal mines as a rule do not generate gas, therefore their ventilation has not, in many cases, received proper attention. Natural ventilation in metal mines is usually provided for by surface openings at different elevations which, in most cases, give a very satisfactory distribution of fresh air. Where there is but slight difference in elevation of two or more openings it is necessary to install mechanical ventilation whereby fresh air is supplied by fans. Coal mines, and frequently metal mines, are often opened by a drift-slope tunnel or adit with no outlet at the inner end, so that it is necessary to use a force fan to send in new air to the working force. The fresh air then circulates through the places in the mines where the men are at work; the air thus circulated becomes more or less vitiated as to its oxygen content, and is also burdened with gas and dust, before escaping from the mine. Its escape is often assisted by a suction fan. The circulation of large volumes of air is necessary to make working conditions tolerable in gaseous mines.

SYSTEMS OF MINING.

There are two classes of mines, namely: (a) Open-pit mines, which are operated with or without steam shovels, and (b) underground mines, which are entered by a shaft, drift, entry or slope, and in which the mining is done under cover of rock.

Open-pit Mines.— This class of mines is becoming more and more important since the development of the steam shovel. In the iron mining districts of Minnesota, it is not uncommon for mines to be operated where an overburden of 100 or 150 feet is stripped and carried a distance of three or four miles in order that large ore bodies may be exposed. After the overburden has been removed the operation of the steam shovel is continued and the iron ore loaded into railway cars which are provided for it in the bottom of the pit which in many cases is 80 acres, or more, in area. Steam-shovel mining is the principal method of mining ore in Minnesota, and is rapidly coming into favor for mining copper ores in Arizona, Utah and Nevada. The steam shovel is becoming an important factor in coal mining where an overburden of 15 to 50 feet may be removed from a four- or five-foot coal bed, and the coal loaded by steam shovel into railroad cars. The open-pit mines operating without steam shovel are usually small and in this connection the overburden is removed by drag line scrapers, wheel scrapers, as in the case of railway excavations, or by the use of wheel-barrows and hand labor. This work is confined largely to the less important minerals, as barite, small iron-ore deposits, phosphate deposits and to shallow coal beds.

Placer Mining.—Another class of open-pit mines is known as placers or placer mines, where gold-bearing sands and gravels are mined for the gold which they contain. In the earliest stages of placer mining the gravel was washed in pans, the gold collecting at the bottom, and saved as metallic gold. This was followed by mechanical devices such as the rocker, long tom and sluice. The sluice consists of a long wooden trough or box, or channels cut in the bed rock, provided with riffles in which the gold collects as the gold-bearing sands are washed through the sluices. Mercury is spread in the bottom of the sluice so as to catch the fine particles of gold, forming a gold-mercury-amalgam. The «clean-up» takes place at stated intervals when the amalgam is collected and the mercury is driven off by heat and the gold collected. The large placer operations are known as hydraulicing and dredging. Mining by hydraulic methods consists in using water under various pressures from 250 to 400 pounds per square inch, which escapes through a nozzle and is directed at the gold-bearing gravel banks; as the water carries the finer gravels and sands to the sluices the gold is collected in the manner described above under sluicing. The latest commercial development in placer mining is dredging, whereby it is possible to recover sands and gravels containing as low as five or six cents in gold per cubic yard. The powerful dredges scoop up the sand and pass it through screens, the finer material being washed through sluice boxes provided with riffles and mercury traps and the gold is recovered by cleaning out the sluice and retorting the amalgam.

Underground Mining.—*Stoping.*—A method of mining in which the ore is excavated from a vein by driving horizontally upon it a series of workings, called stopes, one immediately over the other or vice-versa. (See Fig. 1). A stope is an excavation from which the ore has been extracted, either above or below a level, in a series of steps and is usually applied to highly-inclined or vertical veins, or an open place in a thick ore body. The term is frequently used incorrectly as a synonym of room, which is a wide working-place in a flat mine.

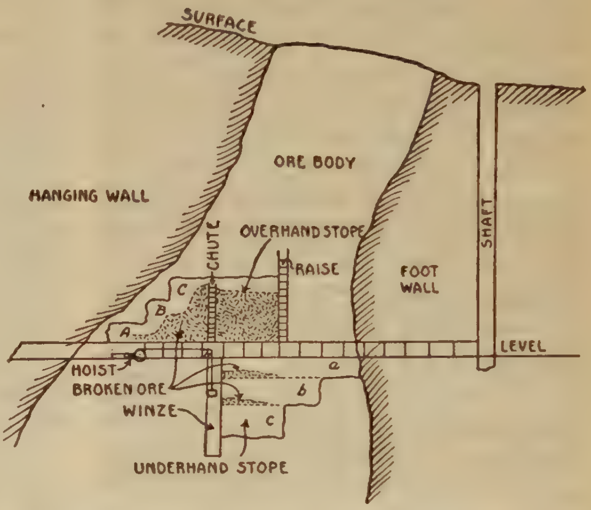

Fig. 1.—Stoping Method. The upper portion is known as "overhand," and the lower as "underhand" stoping.

Each horizontal working or stope (probably a corruption of step), when a number of them are in progress, assumes the shape of a flight of stairs. When the first stope is begun at a lower corner of the body of ore to be removed, and, after it has advanced a convenient distance, the next is commenced above it, and so on the process is called *overhead stoping.* When the first stope begins at an upper corner and the succeeding ones are below it, it is *underhand stoping.* The term stoping is loosely applied to any subterranean extraction of ore except that which is incidentally performed in sinking shafts, driving levels, etc., for the purpose of opening the mine. This method probably originated in the Cornish tin mines and is applicable to vertical or highly-inclined ore bodies; also to massive deposits which may have great thickness.

Room-and-Pillar.—A system of mining in which the distinguishing feature is the winning of 50 per cent or more of the coal in the first working. The coal is mined in rooms separated by narrow ribs or pillars. The coal in the pillars is won by subsequent working which may be likened to top slicing in which the roof is caved in successive blocks. The first working in rooms is an advancing and the winning of the pillar coal a retreating method. (See Fig. 2). The rooms are driven parallel with one another, and the room faces may be extended parallel with, at right angles, or at an acute angle to the dip. When applied to metal mines, with a good cover, as much as 75 to 85 per cent of the ore is removed, leaving pillars 10 to 20 feet in diameter; wherever possible, pillars are left in the poorest ore, hence their position is more or less irregular as compared with the pillars left in coal mining. This method is applicable to flat deposits, such as coal, iron ore, lead and zinc, etc., which occur in bedded deposits. Modifications of this method are County of Durham system; Double-entry room-and pillar mining; Double-room system; Double-stall working; Heading and stall; Pillar and stall; Post and stall; Room and stoop; Single-entry room-and-pillar mining; Single-stall working; Square work (South Staffordshire thick seam method); Stall and breasts; and Triple-entry room-and-pillar mining.

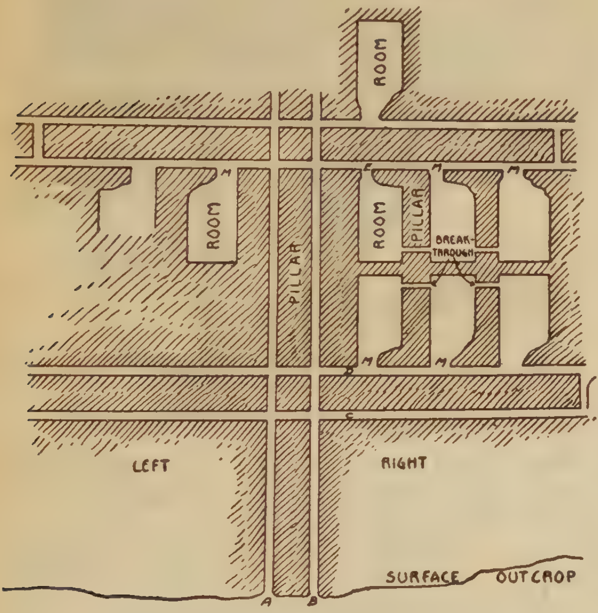

FIG. 2.—Room and Pillar Mining.

Longwall Method.—A system of working a seam of coal or ore in which the whole bed or seam is taken out and no pillars left, excepting the shaft pillars, and sometimes the main-road pillars. *Longwall advancing* consists in mining the coal outward from the shaft pillar and maintaining roadways through the worked-out portion of the mine. (See Fig. 3, in which the arrows indicate the direction of advance and points to the working face). *Longwell retreating,* first driving haulage roads and airways to the boundary of a tract of coal and then mining it in a single face without pillars toward the shaft. The longwall method is usually applied to coal mining and occasionally to flat ore deposits, as iron, etc. This system of mining is also known as Longwork, Shropshire method, Combination longwall and Nottingham or Barry system.

Milling.—A system of mining originating in the combination of open cut and underground mining, where the ore is mined in open cut (surface workings) and handled underground. It is underhand stoping applied to large deposits, wherein the ore is mined near the mouth of winzes or raises and dropped by gravity to working levels below for transportation to the surface. Sometimes called «glory-hole» method. (See Fig. 4).

Caving System.—A method of mining in which the support of a great block of ore being removed, it is allowed to cave or fall, and in falling is broken sufficiently to be handled; the overlying strata subsides as the ore is withdrawn. Two important variations are Top slicing and cover caving; Top slicing combined with ore caving.

Top Slicing and Cover Caving.—The important feature in this method is the working of the ore body from the top down in successive horizontal slices that may follow one another sequentially or simultaneously. The whole thickness of the slice is worked and the ore broken by overhead or under hand stoping in each unit. It is a retreating method, as the overburden or cover is caved after mining a unit. The longwall, the pillar robbing in both room-and-pillar and bord-and-pillar methods of mining coal are essentially the same in principle as top slicing. The principal difference is that a single slice only is worked in these methods when applied to coal mining. There are two modifications: top slicing by drifts and top slicing by rooms. A timber mat is used as a cover in almost all cases. The method is applicable to thick or massive ore deposits. Other terms used for this system are Caving system; Crosscut method (combined with removal of pillars); Horizontal slicing descending; Mining ore from top down; Panel slicing; Prop slicing; Removing pillars and allowing roof to cave; Slicing under mats of timber in panels; Square-set slicing; Top slicing and caving; Transverse slicing with caving.

Top Slicing Combined with Ore Caving.—In this method the ore body is worked from the top down in successive slices. Instead of taking the full height of the slice, only the lower part is taken and the upper part is caved. After removing this portion of the ore, the cover is caved. A timber mat is used in most cases to separate the broken cover from the ore to give safety. Also known as Caving system, Sub-drifting and caving, Sub-slicing, Slicing under ore with back caving in rooms, Sub-level caving and Sub-level slicing.

Explosives.—In all methods of mining, explosives are essential. The maximum amount of explosives is used in stoping and room-and-pillar methods, while a minimum amount is used in the caving system and its various modifications, due to the fact that much of the ore is loosened by caving of the overburden. The importance of the mining industry is further shown by the fact that 75 per cent of all explosives used in the United States are used in the mining industry (not including quarries). The enormous production from the mines in the United States would not be possible without the use of large amounts of explosives. The total production of explosives in the United States in 1917 was as follows: Black powder, 277,118,525 pounds; dynamite and high explosives other than permissibles, 262,316,080; permissibles, 43,040,722. Of the black powder, 85 per cent was used in coal mining; of high explosives, 10.8 per cent; and of permissibles, 76.5 per cent. Other mining consumed 3.4 per cent of the black powder, 50.4 per cent of high explosives and 14.2 per cent of permissibles. In the production of coal an explosive is required which will not shatter the coal and at the same time not produce too long a flame nor too much heat and thus ignite gas and dust with which it might come in contact. This led to the introduction of so-called safety or short-flame explosives in the coal mines of Pennsylvania at Johnstown in 1902, and since that date their use has increased rapidly. The term «permissible explosives» was coined by Dr. J. A. Holmes in 1908, and in 1909 the Federal Bureau of Mines established a testing station at Pittsburgh to determine the permissibility of explosives that are to be used in coal mines. This work is still being carried on in connection with the investigation of mine explosions to determine the nature and character of an explosive that will meet the needs of the various branches of mining, and especially to increase safety in coal mines. Both the improper use of explosives and the use of improper explosives have resulted in coal-mine disasters. The Federal Bureau of Mines has brought about what is little short of a revolution through the introduction of new types of low-temperature, quick-flame powders, designated as «permissible explosives,» for use in the more dangerous coal mines of the country. In the bituminous coal mines of the United States the fatality rate per 10,000 men employed has been reduced from 3.39 in 1903 to 0.80 in 1917, largely as a result of the use of permissible explosives. In metal mining a different type of explosive is needed, namely, one which will shatter the hard mineral formation, and for this purpose dynamite of different grades is employed. Black powder, by reason of its slow heaving action, is used to a certain extent in the iron mining districts, where steam-shovel work is carried on, and where it is necessary to loosen large masses of soft or friable ore.

Mine Haulage.— The transportation problem is one of the most important features in the development of the mining industry with which the mining engineer and mine manager have to deal. (It is seldom given a passing thought by the layman). The quantity of merchantable material handled by the various mines and quarries in the United States during a single year is in excess of 1,000,000,000 tons. The work of the Panama Canal is cited as perhaps the greatest engineering feat in modern times, yet the amount of material handled at the canal each year was but slightly in excess of the amount of iron ore and overburden removed annually in two States, namely, Michigan and Minnesota. The task of moving 1,000,000,000 tons of ore, coal and rock would require 20,000,000 50-ton cars. Reducing this to trains of 40 cars, each would represent 500,000 trains. Assuming the average length of a 50-ton car as 40 feet, the length of train required to carry the above amount of ore would be 151,500 miles, or six times the circumference of the earth. The mine-haulage problem is usually separated into three divisions: (1) *Underground haulage,* that is, from the working face of the mine to the bottom of the shaft or to the surface in the event that the mine is opened by a tunnel or adit. (2) *Hoisting,* that is, handling the ore or coal from the mine through either vertical or inclined shafts to the surface. (3) *Surface haulage,* which delivers the ore or coal from the mouth of the shaft to ore bins at smelters or coal tipples at railway yards.

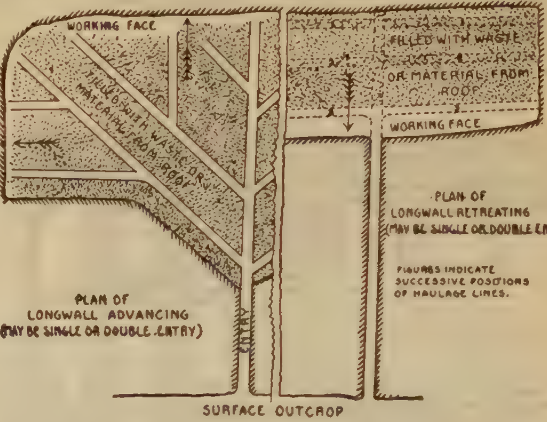
WORKING FACE
FILLED WITH WASTE OR MATERIAL FROM ROOF
FILLED WITH WASTE OR MATERIAL FROM ROOF
WORKING FACE
PLAN OF LONGWALL RETREATING (MAY BE SINGLE OR DOUBLE ENTRY)
FIGURES INDICATE SUCCESSIVE POSITIONS OF HAULAGE LINES.
PLAN OF LONGWALL ADVANCING (MAY BE SINGLE OR DOUBLE ENTRY)
ENTRY
SURFACE OUTCROP

Fig. 3.— Long Wall Method of Mining.

Evolution of Mine Haulage.— In the early years of the mining industry the transportation of ore or coal was crude, and even to-day primitive methods prevail in the more remote districts. In China the ore is transported by coolies, and in some of the mining regions of Mexico Indians carry the ore on their backs for perhaps a number of miles. This class of transportation will apply both to surface and underground workings. In Central America Indians carry ore in a box mounted on two small poles, similar to a hospital stretcher, two men working together. In Peru and Bolivia the llama is the beast of burden and occupies the same position as the burro in Mexico. In early years a large percentage of the coal transportation underground in Great Britain was handled by women and children. The coal was loaded into buckets which were mounted on sleds and when these were used in thin coal beds it was necessary for the women or children to creep along the floor on their hands and knees and draw the sled behind them. A laborious task indeed. The next step in underground transportation was the introduction of two-wheel carts and wheelbarrows, followed by small wooden cars operated on wooden tracks. In 1803 the wooden tracks were first covered with strap iron. The motive power in these cases was largely women and children, and this condition existed in Great Britain until prevented by law in 1842. In 1846 ponies were first used in the English mines. The next improvement was the introduction of *iron tracks* followed by the use of substantial wooden cars and sheet-iron cars with a capacity of about one ton. The cars were enlarged and horses and mules were introduced into many of the mines, and to-day occupy an important place in underground and surface haulage in both the United States and foreign countries. In many cases the animals are lowered into the mines and remain there until they are either crippled or too old to work. Dogs have been used to some extent for haulage purposes, and as late as 1909 one coal-mining company in Illinois was reported as using 31 dogs for this purpose. Dogs are used in the far North for transporting mine supplies during the winter season, when the snow and ice are suitable for sleighing purposes. Steam locomotives have been used underground since the early 50's, but on account of the smoke given off their use is restricted to small, well-ventilated areas. The compressed-air locomotive was introduced into the mines about 1885 and still occupies a prominent place in the mining industry. Electric haulage was begun in 1887 and is now common in the large coal and metal mines. The first electric tramway for mine use was installed in Colorado in 1890. In 1890 electrical storage battery locomotives were first considered for use in mines, and to-day they are in successful operation. They are used largely inside the mines for gathering the coal from the working face and delivering it to the main haulage system. In the operation of these locomotives a track is laid from the main haulage system to the working face, and the storage-battery locomotive operates over these lines without the danger attending installations where trolley wires are in place. The latest motive power applied to mine haulage is the gasoline locomotive, and tests on this engine indicate that it may be an important factor in underground transportation, providing ventilation is such as to get rid of the waste gases.

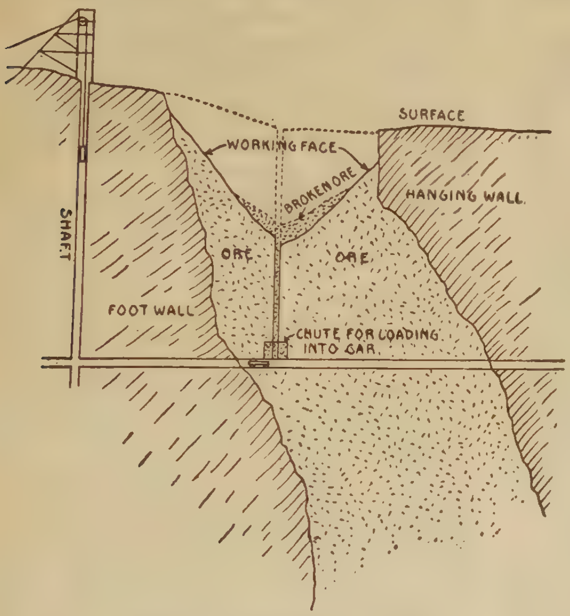

FIG. 4.— Milling System of Mining.

Hoisting.— Hoisting through inclined or vertical shafts is the connecting link between underground and surface haulage. In some of the old abandoned mines in Mexico, the prospector frequently finds notched poles, nicknamed «chicken ladders,» which were used by the early Spaniards and the Indians in mining the precious metals. The ore was placed in skin bags containing 50 to 100 pounds each and carried on the backs of the natives as they climbed these poles to the surface. Oftentimes a series of these ladders would cover an elevation of 500 to 1,000 feet. Similar methods of ore transportation are still in use in remote districts of China. Vertical ladders were used for many years for carrying ore to the surface, which now find a place only as a secondary escapeway to be used in case of accident. Following this was the introduction of a crude hand windlass with ropes made from the skins of animals. The hand windlasses are usually known as «Armstrong» hoists, as the power is applied through the arm of the operator. The next improvement was probably in the matter of cables whereby the skins were successively replaced by hemp, cotton and steel cables. As work progressed, the hand windlass was replaced by the horsewhim wherein by means of a long sweep geared to a drum the horse performs the winding as he travels in a circle. Following this was the small steam plant which is now in common use in all prospects and small mines in all the mining districts. These small steam winding plants will handles 500 to 1,000 pounds of ore at a single hoist, and have been gradually enlarged and improved until we have to-day the huge plants with winding drums 20 to 30 feet in diameter and capable of containing 5,000 to 6,000 feet of cable. The largest hoist of this kind is the one used at the Tamarack shaft, Michigan, where ore is hoisted at a single lift from a depth of 5,260 feet vertically. The Transvaal mines in South Africa are from 2,000 to 5,000 feet deep, and next to our Michigan mines have the best hoisting equipment of any mines in the world. These shafts are equipped with hoisting plants that will handle from 5 to 10 tons of ore at a single trip, at a rate of 3,500 feet per minute. The majority of these larger hoists are operated by steam. The increasing use of electricity has led mining engineers to consider the question of substituting electric motors for the steam hoisting engine. The first electric hoist in America was installed in July 1888 at Aspen, Colo. The motor was seven and one-half horse power with a capacity of handling 1,500 pounds at the rate of 100 feet per minute. In 1894, then the largest electric hoist in the United States was installed in Colorado. The plant consisted of a 150 horse-power motor with an auxiliary 60 horse-power motor. There were two reels, each capable of containing 1,500 feet of 4½-inch × ⅜-inch flat cable. The cage weighed 1,375 pounds, and operated at a speed of 600 feet per minute. It had a capacity of carrying an overbalanced load of 10,000 pounds. The Seamans-Ilgner electric hoisting system utilizes high tension currents that are reduced to about 500 volts. Between the motor and generator is mounted an enormous balance wheel which is kept in continuous motion and absorbs the shock due to the sudden starting of the heavy loads. A hoist of this type is now in use at the Hecla mine, Burke, Idaho. The balance wheel weighs 30,000 pounds. There are two reels, each capable of holding 2,500 feet of ⅜-inch × 4-inch flat steel cable, and hoisting at a speed of 2,400 feet per minute. The capacity of this hoist is 16,000 pounds unbalanced load from a depth of 2,500 feet. The total weight of the equipment is 300,000 pounds.

Another electric hoist recently installed is that of the Ray Consolidated Mining Company, Ray, Ariz. While it is not intended to hoist from a great depth, it handles a load of 12½ tons from a depth of 500 feet at a rate of 300 feet per minute.

Surface Haulage.— The evolution of surface haulage follows closely to that of underground work as given above, beginning with coolies in China, Indians in Mexico as men of burden, followed by the llama, burro and pack trains, and later by wagons, as represented by the 20-mule-team of a borax company in California. A few years ago 125 horse-power traction engines were tried in the West many of which were abandoned on the plains by reason of the fact that they could not carry sufficient fuel and water to run them across the desert country. Steam, compressed-air, gasoline and electric locomotives are in almost universal use in the various mining districts of the United States. The introduction of the motor truck is now quite common in many of the remote districts where railroads have not yet been built.

Wire Rope Trams.— Wire rope trams were first introduced 200 years ago. Cable ways, such as are now used in quarries, were invented and used in 1851. One of the earliest large installations of cable ways was in the Tilly Foster mine, New York, where 600,000 tons of ore was recovered after the removal of an overburden of 300,000 tons. A typical example of the aerial tram is that of the American Nettie mine in Colorado. This tram is 3,400 feet long, the first 500 feet of it sloping 45 degrees. The longest span is 1,800 feet. The ore is carried in buckets each carrying 1,000 pounds of ore. Another example of an aerial tram used in coal mining is one installed at Electric, Mont. The cable is 7,800 feet long, the elevation of the upper end of which is 1,200 feet above the lower. This type of transportation finds a place in rough inaccessible mountain regions.

Gravity planes are used at some of the mines, as for example, the one now in use at the Boston Consolidated mine in Utah. This plane is 1,900 feet long sloping 22 degrees, and representing a height of 737 feet. Twelve-ton skips are used on this incline and 1,350 tons of ore is handled per eight-hour shift. This is one of the largest incline planes in the United States.

Belt Conveyor.—An example of belt conveyors is that recently installed at Miami, Ariz., where a 30-inch belt conveyor travels 300 feet per minute up an incline of 15 degrees. The capacity of this belt is 2,000 tons of crushed ore daily. Belt conveyors are used largely in ore-dressing plants, cement mills and other surface plants. Many of these are operated by electric motors.

Endless Rope Haulage.— Endless rope haulage is in use at many mines.

Railway Haulage.—At nearly all large mines, the major part of the surface haulage is on the scale of railroad operations. For example, in the Minnesota iron mines, and copper mines in the West where the mining is done by steam shovels, the ore is loaded direct into 40 or 50-ton steel cars. In the case of the Minnesota iron mines these loaded cars are sent 75 to 100 miles to Duluth to the ore docks, where the cars are dumped automatically into bins from which the ore is drawn into the lake steamers. It requires less than two hours to load one of these steamers with 10,000 tons of ore. In the case of the Western copper mines, the standard gauge cars that are loaded by steam shovel are sent direct to the smelter varying from only a few miles to 100 or more.

Treatment of Ores.—After the ore or mineral has been mined, it is subjected to various metallurgical treatments as the case may require; thus iron ore is sent direct to the blast furnace where it is melted into pig-iron. Copper ores are concentrated and the concentrate sent to the blast furnace where it is smelted in a manner similar to the iron ores, thus producing copper bullion. Gold and silver ores require various treatments depending upon the character of the ore, the principal methods being stamp milling, amalgamation, cyaniding, chlorination and lixiviation. (See article on GOLD MINING). Lead ore, after concentration, is smelted in an ordinary blast furnace, while zinc ore is distilled in retorts and collected in its metallic state known as spelter. Mercury is likewise distilled and condensed in retorts and when cold remains liquid. The treatment of minerals from which such metal as chromium, cobalt, titanium, tungsten and vanadium are obtained is described under the various headings. See COPPER; GOLD; LEAD; ZINC, etc.

Bibliography.— The following books (frequently used as textbooks) are sources of much information on various phases of the mining industry:

MINING AND MINING METHODS.— Hoover, H. C., 'Principles of Mining'; Ihlseng, M. C., and Wilson, E. B., 'A Manual of Mining'; Crane, W. R., 'Ore Mining Methods'; Mayer, L. W., 'Mining Methods in Europe'; Sanders, W. E., MacDonald, B., and Parlee, N. W., 'Mine Timbering'; Brinsmade, R. B., 'Mining without Timber'; Storms, W. H., 'Timbering and Mining'; Redmayne, R. A. S., 'Colliery Working and Management'; Weatherbe, D'A., 'Dredging for Gold in California'; Wilson, E. B., 'Hydraulic and Placer Mining'; Peele, R., 'Mining Engineer's Handbook'; Fay, A. H., 'Glossary of the Mining and Mineral Industry.'

PROSPECTING AND GEOLOGY.— Gunther, C. G., 'Examination of Prospects'; Spurr, J. E., 'Geology Applied to Mining'; Stretch, R. H., 'Prospecting, Locating and Valuing Mining'; Farrell, J. H., 'Practical Field Geology'; Lindgren, W., 'Mineral Deposits'; Kemp, J. F., 'Ore Deposits of the United States and Canada': Rickard, T. A., 'Ore Deposits'; Posepny, F., 'Genesis of Ore Deposits'; Eckel, E. C., 'Iron Ores'; Shamel, C. H., 'Mining, Mineral and Geological Law'; Ries, H., and Watson, T. L., 'Engineering Geology.'

Mine Surveying.— Trumbull, L. W., 'Manual of Underground Surveying'; Durham, E. B., 'Mine Surveying'; Shurick, A. T., 'Coal-mine Surveying.'

Mining Economics.— Charlton, W. H., 'American Mine Accounting'; Finlay, J. R., 'The Cost of Mining'; Rickard, T. A., 'Economics of Mining'; Skinner, E. N., and Plate, H. R., 'Mining Costs of the World.'

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MINING ENGINEERING, is that branch of engineering which pertains to the operations of extracting useful minerals from the deposits in which they occur. While no distinct line can be drawn between the fields occupied by mining and mining engineering, the former may be termed an art and the latter a science. The present article will be confined to a consideration of the qualifications, professional duties and training of the mining engineer; the subjects relating to mining as an art, namely, the modes of searching or prospecting for mineral deposits, the various systems or methods of working mines, and the details of the operations connected therewith, are dealt with under the head of Mining.

The province of the mining engineer comprises the testing and valuing of mineral deposits, the planning and execution of the various mining works required to reach the deposit — such as tunneling, shaft-sinking, etc.— the choice and application of a suitable method of opening the mine and bringing the ore to the surface; and, lastly, the installation of the necessary surface and underground plant. In addition, therefore, to a knowledge of the theory and practice of the various kinds and methods of mining, the successful pursuit of the profession demands not only a training in mathematics, mechanics, physics and other fundamental subjects which underlie all technical education, but also an intimate acquaintance with certain of the natural sciences, particularly geology, mineralogy and chemistry, and many of the principles of civil, mechanical and electrical engineering. In a well-planned course of professional instruction the scientific studies would preferably come first, but the engineer is incomplete until to these he adds a knowledge of the actual practice of mining. The arts of metallurgy, ore-dressing and milling, moreover, are so related to the art of mining that these subjects also, at least in part, must be included in the equipment of the mining engineer. The functions of the mining engineer cannot be defined in precise terms, largely because of the infinite variety of local conditions which may be encountered, and the differing physical, mineralogical and chemical characteristics of the ore deposits themselves. (See Ore Deposits). There has been perhaps a greater tendency toward specialization in mining than in other departments of engineering. As the professional field has broadened, no one man can hope successfully to cover it all. Quite a sharp distinction exists, for example, between metal mining and coal mining. The modes of deposition of coal and of the metalliferous ores, the geological and physical conditions, and the accepted systems of mining, are so different that the engineering of collieries has become largely a specialty. So again among the metals themselves. Engineers may be led to specialize in the direction of iron, or lead and zinc, or copper, or gold and silver mining. This latter differentiation is not the result of any fundamental diversity in the methods of developing and working the mines, but is due rather to differences in the scale of operation, the physical characteristics of the deposits themselves, the treatment of the ores of the various metals and their final disposition. It frequently happens that the dressing, or concentration, and even the smelting, or other process for the reduction of the ore, are carried on at or near the mine itself, and under the same general management. The mining engineer, therefore, must be something of a metallurgist also, and, though not necessarily highly skilled in this direction, he should at least be able to decide upon and select the plant and process appropriate to the character of the ore, and to supervise its erection and operation. But this applies to the mining and treatment of the non-ferrous metals. The metallurgy of iron and steel forms far too large a field to be included in the range of work of the mining engineer. It requires a special training, and has developed into a distinct profession.

Several more or less conventional distinctions are made as to the particular branch of work in which a mining engineer may specialize. He may devote himself to examining, valuing and reporting on mines, being engaged for such work by intending sellers or buyers; he may serve in the capacity of consulting engineer for one or more mining companies; or in doing a general business he may be retained by his clients in an advisory capacity similar to that occupied by a counsellor-at-law, leaving to others the actual execution of the work or the carrying out of the policy determined upon. On the other hand, a mining engineer who becomes identified with the management of the affairs of a particular company must be a successful organizer and business man; he must possess the ability to make favorable contracts for work, the purchase of material and disposal of product, to control men, and not only to plan work but to know how it should be executed to attain the best economic results. He often combines with his purely professional functions the duties of superintendent or manager, and the smaller the property the greater usually is the variety of responsibility devolving upon the engineer. When in charge of a small or temporarily non-paying mine, especially one situated in a remote region, the engineer may be compelled to serve simultaneously in the capacities of superintendent, foreman, assayer and bookkeeper. He must know enough of chemistry and of civil, mechanical and electrical engineering to exercise intelligent control in matters relating to these branches, and he should have at least a general knowledge of mining law.

Formerly, the profession of mining engineering was less complex and exacting in its requirements than at the present time. The great advances made during the past 50 years in scientific and technical lines have brought with them constantly increasing responsibilities. An inspection of the course of study prescribed in mining schools of good standing will show how largely the education of a student in mining engineering lies in the direction of subjects not relating specifically to the art of mining itself. Manual labor has been more and more replaced by mechanical appliances, and the engineer must be alert in availing himself of the innovations which have been introduced in endless variety; the ever-widening applications of electricity and compressed air for the transmission of power, the use of internal combustion engines, the numerous improvements in machines and processes for the concentration and reduction of ores, the increase in knowledge of the relations of geology to the deposition of ores; all these constitute new tools in the hands of the mining engineer, but they unite also in demanding a broader and more severe training. Up to 1870 applications of electricity and compressed air to mining were practically unknown; now they are employed in nearly all departments of mine work. Compressed air rock drills are used everywhere for both surface and underground excavation of rock; electric and compressed air locomotives or rope haulage have superseded hand tramming and haulage by mules and horses, wherever the conditions are suitable and the quantity of material dealt with is sufficient to warrant the additional first cost of plant; the greatly increased depths at which mining is carried on in many districts have made necessary the design and erection of enormously powerful and complicated hoisting engines; and finally, the successful and economical operation of such plants requires the maintenance of well-equipped machine and other repair shops.

The question of hoisting large quantities of ore from great depths, that is, vertical depths of say more than 5,000 feet, is one of the most serious mechanical problems at present confronting the mining engineer. Depths of approximately 5,000 feet have been already attained in several mining districts, notably in the Lake Superior copper region and the Witwatersrand in South Africa, while in the important Butte, Mont., copper district, the silver mines of the Comstock Lode, Nevada, and the Bendigo gold fields of Victoria, Australia, depths of 3,000 to 3,500 feet have been or are being reached. In a number of places where the present maximum depth of shaft does not exceed 3,000 feet, elaborate engines capable of hoisting from 5,000 feet or more have been installed. The prosecution of work at such depths involves the solution of rather intricate problems, among which are the proper construction of hoisting drums for winding the great lengths and weights of rope required, the design of reliable controlling apparatus for hoisting at speeds of 3,000, 4,000 or even 5,000 feet per minute, the means of raising and lowering with safety, speed and economy the hundreds of men required in large and deep mines, and the difficulties involved in the varying weight of the rope itself, as it winds upon its drum, a weight which often greatly exceeds that of the ore raised at each hoisting operation. A high degree of mechanical skill and knowledge is demanded for the effective solution of these and other problems. Consult discussions on «Hoisting from Great Depths,» which appeared during 1902 and 1903 in the ‹*Transactions* of the Institution of Mining and Metallurgy,› London, the South African Association of Engineers; and the *Engineering and Mining Journal*, New York.

In all branches of his work the mining engineer of the present day finds himself compelled to introduce every new method and appliance that promises some saving in the cost of production. This is the result, not only of competition and of increase in wages but also of the reduction in market price of nearly all of the metals within the past four decades. In 1873 the price of silver was $1.30 per ounce; now (May 1919) it is $1.01; copper was then worth 30 cents per pound, now 15.3 cents; lead was then 6.5 cents per pound, now 4.7 cents, and other similar examples of the decline in value of the staple metals can be cited. Furthermore, as the more easily accessible mineral deposits are exhausted, the mining engineer is called on to practise his profession farther afield, often in regions remote from centres of population. Here he may be confronted with new problems arising from the lack of transport facilities, distance from source of supplies and materials, labor insufficient in quantity and poor in quality and adverse and unhealthful climatic conditions.

That function of the mining engineer which relates to examining and reporting on mining properties is both delicate and difficult, and calls for the highest degree of professional efficiency. In brief, the examination of a mine includes a study of the local conditions, topographical, geological and economic, and of the mineral deposit itself; the mineralogical character, quality, quantity and grade of the ore and its value per ton; an estimate of the cost per ton of mining the ore and the net profit which reasonably may be expected; and, lastly, the probable life of the mine. Upon these factors depends the market value of the property. In determining the quantity and grade of the ore, the deposit, as revealed by the development work already done, must be carefully and systematically tested. This is done by taking a series of samples in a manner which will enable the engineer to obtain a true average of such ore as can be examined and measured with sufficient accuracy and definiteness to warrant confidence in the results obtained. Evidently much depends upon how and to what extent the mine has been developed. The variety of conditions which may be met is almost infinite. Nature does not work with rule and plumb-line. Besides the ore which can be actually measured and sampled, the engineer may often be warranted in taking into consideration the quantity of ore which in the future will probably be rendered available by further development of the mine. In balancing such probabilities or possibilities, he must be guided mainly by geological and mineralogical analogies deduced from his previously acquired knowledge and experience. Lengthy discussions bearing upon this subject, by well-known engineers, have been published in the transactions of the mining engineering societies and in the technical periodicals. It may be added that the circumstances under which mine examinations are made are often rendered difficult and embarrassing where the perpetration of fraudulent practices by interested persons may be attempted, for the purpose of misrepresenting or concealing the true condition of the mine; records of cost and of the value and amount of previous production may be falsified, or the samples taken by the engineer tampered with. Constant vigilance is required to guard against such contingencies.

With the development of the mining industry and the wider adoption of mechanical appliances and engineering methods in connection with mining operations, the demand for trained engineers has steadily increased until, at the present time, probably no field of engineering affords better opportunities for a young man. It is true that the course of preparatory study is exacting and the life somewhat arduous, but as yet it is one of the few professions which cannot be said to be overcrowded. Formerly, the so-called «practical» man monopolized most of the positions of responsibilty and emolument, but the educated engineer has made his way to a degree that has produced an active demand for his services. Mining companies have found that the greater breadth of view resulting from a sound technical education has a direct money value. The trained engineer is acquainted with what is being done in his profession in other regions or countries. He keeps himself informed as to the experiments and discoveries made by others; is quick to utilize improved and more economical methods, and knows not only what to do but also what to avoid. His competitor who lacks this knowledge, and who has at his command only what has come within his own personal experience, is in danger of failure, if circumstances bring him face to face with new conditions, and with problems the prompt and efficient solution of which must be based on a familiarity with the principles of engineering practice. It must be remembered that the young graduate of a mining school is not yet an engineer; he has been grounded in the fundamentals of his profession, has absorbed a multitude of facts relating to its practice and his powers of observation have been cultivated; but before he is fitted to deal successfully with the diverse problems which sooner or later will confront him, he must in most cases patiently continue his education in the field for some years after graduation. His first employment is likely to be that of chemist, assayer, draughtsman, surveyor or assistant to one of the heads of department in the mine or works. How fast he advances will depend on his native energy and ability and the efficiency of his preparatory training. Not all young men are fitted by nature to become successful mining engineers. If the student has no aptitude for such a pursuit, the sooner he finds it out the better, both for himself and his instructors. Unquestionably, an immense amount of time, money and energy are wasted in the attempt to give a scientific and technical education to young men whose bent — if they possess any decided bent — is in some other direction. The curriculum of the school, therefore, should be so planned as to eliminate inefficient students as early in the course as possible.

In the making of an engineer, circumstances and opportunity are important. A well-known engineer and instructor has said: «A man without school education may make a remarkable engineer; but it may have taken him years to get his training and at the end of the time there may be whole regions of knowledge utterly unknown to him; in other words, he is liable to be a one-sided man without a broad outlook upon other fields than his own. The school cannot teach him everything, but it can give him the keys to the storehouses which he may need to draw from in after life.» A graduate of a good mining school has this advantage over his uneducated competitor; that he is better able to avail himself of the opportunities presented to him.

Mining Schools.— The need of technical schools specially equipped for preparing young men for the profession of mining engineering was long ago recognized in Europe, and some of the institutions there established have exerted through their graduates a marked and beneficial influence upon the mining industry of the world. Previous to 1865, mining practice in the United States was based chiefly upon European methods, and the earliest work prosecuted on a large scale in this country — for example, at the Comstock mines, Nevada — was in great measure planned and managed by American engineers who had received their education in Europe. The influence of the Continental institutions also made itself felt in the organization of the older American mining schools. The first School of Mines in the United States was founded in 1863 under the auspices of Columbia College, New York. Since then, mining schools have been established in many parts of the country, the total number being now about 40. The majority of them, however, are small, with limited equipments and teaching forces. Many exist simply as departments of technical schools connected with State universities. A few are separate and distinct institutions. The leading mining schools of the United States are the School of Mines of Columbia University, the Mining Department of the Massachusetts Institute of Technology, the College of Mining of the University of California, the State School of Mines of Colorado, the Michigan College of Mines, the School of Mines of the University of Minnesota and the schools at Rolla, Missouri, Lehigh University and Lafayette College. The courses of study leading to the degree of mining engineer generally occupy four years but exhibit quite wide variations in plan and scope. Some of the best of the schools have rigidly prescribed courses; others offer a range of elective subjects, comprised in more or less interdependent groups. Without attempting a comparison of the curricula of these schools, a condensed statement of the ground that should be covered by a well organized School of Mines may here be given:

First Year.— Algebra — general theory of equations (elementary algebra required for admission), analytical geometry, spherical trigonometry (plane trigonometry required for admission), general inorganic chemistry, qualitative analysis, physics, descriptive and determinative mineralogy, including crystallography and blow-piping, theory of surveying and mechanical draughting. In the vacation following the first year, five weeks' field practice in surveying.

Second Year.— Calculus, elementary and analytical mechanics, physics, industrial chemistry, theory of railroad surveying, general geology, elements of electrical engineering, quantitative analysis, descriptive geometry and drawing. In the vacation following, five weeks' field work in general surveying and four weeks' railroad surveying.

Third Year.— Analytical mechanics, economic geology, properties and resistance of structural materials, masonry and timber construction, engineering of power plants, earth and rock excavation, railroad and mine tunnels, boring and shaft-sinking, exploration, development and methods of working mines, general metallurgy, and metallurgy of the non-ferrous metals, graphic statics, assaying, principles of electrical engineering, experimental mechanical engineering, optical mineralogy and petrography. Vacation work: six weeks' systematic study in mines selected for the purpose, one week of mine surveying, one week's study in metallurgical works and one week of field geology.

Fourth Year.— Thermodynamics, steam engines and boilers, heat and its applications, internal combustion engine, hydraulics, ore-dressing, mine engineering, mine plant and equipment, mine surveying, mine administration, metallurgy of silver, gold, copper, lead, zinc, iron and steel, draughting and design of mine plant, geological examinations and surveys, mining laws, thesis or project in mining. Laboratory work is required in connection with geology, mineralogy, physics, qualitative and quantitative analysis, assaying, testing of materials, electrical engineering, metallurgy and ore-dressing.

Admission.— The requirements for admission to the best American mining schools comprise elementary and certain portions of advanced mathematics, elementary chemistry and physics, free-hand drawing, English, history and elementary French, or Spanish. Under certain circumstances, students may be admitted on certificate of other institutions.

Bibliography.—Bowie, 'A Practical Treatise on Hydraulic Mining in California' (10th ed., 1905); Brough, 'Mine Surveying' (14th ed., London 1916); Bulman and Redmayne, 'Colliery Working and Management' (London 1896); Charleton, 'Report Book for Mining Engineers' (1895); Curle, 'The Gold Mines of the World' (1902); Denny, 'Deep Level Mines of the Rand' (1902); Durham, 'Mine Surveying' (1913); Finlay, 'Cost of Mining' (1909); Foster, 'Ore Mining' (1910); Futers, 'Mechanical Engineering of Collieries' (1909); Goupilliere, 'Cours d'exploitation des mines' (Paris 1897); Habet, 'Cours d'exploitation des mines' (Liège 1906); Hoover, H. C., 'Principles of Mining' (New York 1909); Horwood, 'Gold Deposits of the Rand' (1917); Hughes, 'A Text Book of Coal Mining' (1901); Kerr, 'Practical Coal Mining' (1914); Ketchum, 'The Design of Mine Structures' (New York 1912); Pamely, 'The Colliery Manager's Handbook' (1898); Peele, 'Mining Engineer's Handbook' (1918); Redmayne, 'Modern Practice in Mining' (4 vols., London 1908–11); Skinner and Plate, 'Mining Costs of the World' (1915); Storm, 'Timbering in Mining' (New York 1909); Stretch, 'Prospecting, Locating and Valuing Mines' (1903); Truscott, 'Witwatersrand Gold Fields' (1907); Williams, 'The Diamond Mines of South Africa' (1902); Wilson, 'Hydraulic and placer Mining' (1918); Young, 'Elements of Mining' (1916). Also consult the 'Transactions' of the following societies: American Institute of Mining Engineers, New York; Institution of Mining and Metallurgy, London; Institution of Mining Engineers, Newcastle-upon-Tyne, England.

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MINING ENGINEERS, American Institute of, an organization founded in 1871 to promote the arts and sciences connected with the economical production of the useful minerals and metals, and the welfare of those employed in these industries, by means of meetings for social intercourse and the reading and discussion of professional papers, and to circulate, by means of publications among its members and associates, the information thus obtained. The publications of the organization are issued in three volumes of 'Transactions' annually and in the monthly *Bulletin.* The headquarters are in New York City in the Engineering Building. Membership over 5,000.

MINING GEOLOGY, the application of geology to the exploitation of mineral resources. See MINING; GEOLOGY; also ORE DEPOSITS; ECONOMIC GEOLOGY.

MINING INDUSTRY, American. See MINING.

MINING LAWS OF THE UNITED STATES.* **Government Ownership of Minerals — Discovery of Gold.**— The United States mining statutes apply mainly to the ownership and acquisition of minerals in the public lands. They do not regulate or control underground mining operations. The government on its formation made no claim to minerals in lands within the original States. The Ordinance of 20 May 1785, providing for the disposal of public lands, reserved one-third of all gold, silver, lead and copper mines. An early enactment of Congress required surveyors to note in their fieldbooks the situation of all mines. By resolution, 16 April 1800, Congress authorized the collection of information relative to copper mines near Lake Superior.

A system of leasing the lead mines and of reserving all salines was in force for many years. But President Polk in his first message, 2 Dec. 1845, suggested that the leasing system was defective and unprofitable, and recommended that mineral lands be sold «reserving to the government an equitable percentage of the gross amount of mineral product.» The policy of the government always has been to reserve all minerals and to dispose of them by methods distinct from that of the disposal of other public lands. No discovery of the precious metals had been made in the public lands before the cession of the territory by Mexico, in 1848. For 300 years the Spaniards had found no gold in the sands of that vast domain. Americans, seeking the development of the country, discovered the precious metal before the treaty of peace was signed. At this time there was no statute authorizing the private appropriation of minerals discovered upon the public domain. The laws of the United States were never extended to the territory acquired from Mexico, but automatically this domain came under military rule, and on 12 Feb. 1848, 10 days after the peace treaty had been signed and 25 days after the discovery of gold, the military governor, Col. R. B. Mason, issued a proclamation abolishing the Mexican laws and customs prevailing in the California region relative to the denouncement of mines. But Mexican rule and law over the ceded territory ended without this manifesto. No law authorized and none prevented miners from prospecting for gold. Pioneers were occupying the land without Congressional license, and the miners began prospecting under the passive leave of the government. The silence of the ruling body was construed to be consent. From the time of the discovery of gold until 1853 there was neither authority nor law permitting, prohibiting or condemning the wholesale trespassing upon the public lands, and the mining and appropriating the minerals that belonged to the government. In 1853 the Supreme Court of California decided that the deposits of gold and silver within its boundaries belonged to the State. The Congress, and the executive branch of the government, acquiesced in this holding, and mining operations on the public domain grew to vast proportions. Not until 1861 was this doctrine of State ownership repudiated, and the title to the minerals conceded to be in the United States.

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* This article treats only of the United States mining statutes. The mining codes of the various states regulate mining operations under ground and include features separate and distinct from those of the Federal mining statutes.

In the meantime, miners from the southern Appalachian regions, from the tin and lead mines of Great Britain, from the mines of Mexico, South America, Continental Europe and from the islands of the sea, and adventurers from the Eastern States and from all quarters of the civilized world poured into California as a new El Dorado.

Miners' Rules and Regulations.—At the beginning of this wild rush there was locally no law to restrain and no court to punish an offender for trespass, misdemeanor, larceny or murder. The miner whose rights were invaded, or whose property was taken, had neither court nor authority to which he could resort for the protection of his rights, or redress of his wrongs. This tide of immigration carried on its crest men of learning, integrity and honor; but it also swept before it the derelicts of society, the depraved, the vicious, the thug and the thief — criminals fleeing from punishment past or prospective. For self-protection, the thoughtful and law-abiding prospectors organized themselves into local communities acting with the direction and authority of constituted bodies exercising power to preserve order and punish offenders. These communities were known as «mining districts.» These districts usually included one or more «diggins» or mining camps, and were bounded by natural objects — mountains, gulches and rivers. The districts varied in size from a small mining area to vast stretches of valleys and gorges. In each district meetings were held at stated times, or as necessity might demand, on call. The meetings were in a sense deliberative assemblies, conducted in an orderly manner «with the business tact of American instinct for public assemblies.» The meetings were the people's forum, an instance of pure democracy, legislative in their nature and executive in purpose; they were more than mere occasions for mental effervescence or than safety valves for community complaints. Their sessions were governed by properly selected officers, and records were kept of their proceedings.

These meetings enacted laws for the punishment of offenders, including all grades of offenses. From lack of jails and places of confinement for persons convicted of violating the laws, capital punishment was inflicted on the more serious offenders, and those convicted of lower grades of crimes were flogged or banished. Here also were formulated and adopted rules and regulations for the government of mining claims. These rules stated the miners' rights, prescribed the size of mining claims, the method of locating, holding and working them, and declared the rules as to abandonment and forfeiture, and even the method of using water. They usually stated the conditions that would excuse the working of a claim and permit the claimant to retain title. In some instances, the rules and regulations prescribed the qualifications of locators of claims. Recorders were selected, and their duties were usually defined, including the recording of claims in a suitable book to be kept for that purpose, the book to be open for the inspection of interested persons. A miners' rule or regulation did not acquire validity by the mere enactment, but its legal force arose from the customary obedience thereto after its adoption, and unlike a statute it lost its force and validity from general disuse. On this theory a rule or regulation duly enacted by a regular meeting might on abandonment be supplanted by an unwritten custom that prevailed generally, however different or even contrary to the original written rule.

The origin of these miners' rules and regulations is not well authenticated. It cannot be attributed solely to the American genius for formulating laws, but rather to the American genius for adopting practical ideas and embodying them in workable codes. The gold hunters incorporated into these local codes the valuable features of the mining laws of foreign countries. Their information came from miners working with them from Cornwall, Derby and Devonshire; from Mexico, Chile and Continental Europe. These brought with them the mining laws of their several countries and into the local codes were incorporated the best features of the Chilean, the Mexican and the Spanish mining laws and the rules and terms that were born in the stannary parliament of Cornwall, Derby and Devonshire. These facts, even in the absence of other authority, are sufficiently attested by the mining terms that were incorporated into the earliest of these regulations and that still in form and substance are found in the present mining codes, and in the prevailing mining vernacular.

These rules and regulations were the governing codes of the early prospector and miner. They were of such importance as to be recognized in all Congressional enactments, and are by statutes in the mining States made admissible in evidence in actions relating to mining claims. Federal and State laws governing the location of mining claims have supplanted these local laws, but their influence is stamped upon these statutes, and is reflected in the jurisprudence of Federal and State courts.*

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*A collection of these miners' rules and regulations is found in Volume 14 of the Census Reports of 1880.

Federal Mining Legislation.— Five days after the admission of California as a State, 14 Sept. 1850, Senator Frémont introduced a bill «to make temporary provisions for the working and discovering of gold mines and placers in California and providing order in the gold mining districts.» The discussion of the Frémont bill showed on the part of some senators a desire for the government to retain the ownership of all minerals in the public lands and to create a revenue from the mining operations. A majority of the senators, as evidenced by the vote, were against the revenue idea and in favor of making the mineral lands open to free acquisition and the minerals subject to private ownership without fee, license or royalty. Senator Frémont's bill passed the Senate, but reached the House too late in the session for action.

The miners of California and the people of the country generally accepted the provisions of this bill and the sentiments expressed by the majority vote of the Senate as at least reflecting the attitude of the United States government toward its mineral lands. They assumed that the miners who had been taking the minerals were not to be regarded as trespassers but that these minerals were, and would continue to be, open for free exploration, and the fruit of the miners' work was to be without rent or royalty. From 1848, to 1866, the miner dug over the valleys, tunneled into the mountains and took from the earth a billion dollars worth of the precious metals without a single expression of assent or dissent from the owner of both land and minerals. In this period of time these gold hunters accumulated, erected, owned and were operating on the public lands millions of dollars' worth of mining property and were increasing and continuing their industry on the assumption that no barrier would be interposed to their operations.

Congress, on 27 Feb. 1865, passed an act providing that possessory actions between persons for the recovery of mining claims or for damages thereto should not in any wise be affected by the fact that the paramount title to the land and the mineral was in the United States. Proceding the 39th Congress, December 1865, agitation was general on the question of free mining and on the disposal of mineral lands as distinct from that of other public lands. Some public men and private citizens advocated a royalty on minerals as a source of substantial revenue to aid in the payment of the national debt which had reached an alarming sum. Another party insisted that no distinction should be made between the disposal of mineral lands and other public lands. A third party, which proved to be the majority, opposed any change of policy after such long delay and acquiescence on the part of the government. On 13 Dec. 1865, George W. Julian, chairman of the House Committee on Public Lands, introduced a bill providing for the subdivision and sale of gold and silver lands and for the coinage of these minerals as mined. The bill proposed a change in the policy respecting the disposal of mineral lands and was intended to increase the revenues. On 9 April 1866, Senator Sherman of Ohio introduced a bill embodying the recommendations of the Secretary of the Treasury providing for the payment of royalties on the products of mines. This bill was amended by the Committee on Mines and Mining, representing the majority, and favored the free mining policy. The bill as passed by the Senate was entitled, «A bill to legalize the occupation of mineral lands and to extend the right of pre-emption thereto.» It was taken up in the House on 3 July 1866, and on motion was referred to the Committee on Public Lands, but no opportunity was ever given either the Committee or the House to consider the bill. Mr. Higby of California, on 8 March 1866, introduced in the House a bill entitled, «Granting the right of way to ditch and canal-owners in the State of California over the public lands.» This bill was passed 13 June 1866. This bill was taken up in the Senate and amended by substituting the bill formerly passed by the Senate and, as amended, was passed by that body 20 July 1866. The amended bill was taken up in the House 21 July 1866, when the Senate substitute was explained by Mr. Ashley of Nevada, and on his motion the previous question was ordered and the bill was ready to be put upon its passage. Mr. Julian and his followers bitterly assailed the proceedings and viciously attacked the bill. After much filibustering, Mr. Julian was given the privilege of explaining its provisions and he charged that it was an attempt to put the bill through under a gag rule with no opportunity for debate or amendment and that interested persons were attempting to force through the House a measure «revolutionizing the whole land policy of the government, abdicating in the name of the nation its authority and jurisdiction over the richest mineral possession on the face of God's earth, found imbedded here and there over a million square miles of our national territory.»

Thereupon the motion to pass the bill under the previous question was reconsidered and withdrawn and the entire matter was open for discussion and those opposing the bill were given a full hearing. A substitute embodying his views was offered by Mr. Julian and received only 17 votes, and on 26 July 1866 the substituted Senate bill passed the House by a vote of 77 to 37.

The misleading title was retained because the substituted bill had passed the Senate under that title, and possibly to prevent the bill from being referred to Mr. Julian's committee. But no member of either Senate or House was misled or deceived by the title, and instead of the bill being surreptitiously passed, as sometimes charged, it was accorded the fullest and freest discussion in both branches of the Congress and its friends and opponents alike were well informed as to its contents. This act as passed by Congress and found in Vol. XIV, United States Statutes at Large, page 251, consists of 11 sections. The purpose of the bill as declared in the first section was that «the mineral lands of the public domain, both surveyed and unsurveyed are hereby declared to be free and open to exploration and occupation by all citizens of the United States.» It did not purport to be a mining code and its object was not to regulate mining as such, but to authorize entry upon the mineral lands and to permit prospectors and miners to discover and possess themselves of the hidden treasure. It was the first mining law enacted by Congress, and it was the first instance in history where a sovereign, as owner of the minerals, broke away from the old regalian rights and made to the citizens an absolute gift of all the mineral wealth without condition and without limitation. The act of 1866 made no provision for the location of placer claims and on 9 July 1870 the act was amended by the addition of six new sections (16 United States Statutes at Large, 217), providing for the location of placer claims and with some detailed provisions as to procedure in the location of mining claims. The original act of 26 July 1866, after a test of six years, was found to be inadequate in that it failed to give the locator of a claim a sufficient quantity of surface ground for the proper working of a claim, and limited the claim along the lode to 200 feet and did not contain adequate provisions for patent. Experience proved that 200 feet on a vein was insufficient to justify an investment in mining machinery and property sufficient to properly operate a mine. Accordingly a new act embracing all the features of the acts of 1866 and 1870 was passed by Congress, 10 May 1872. This act was entitled, «An act to promote the development of the mining resources of the United States» (17 United States Statutes at Large, 91). It was subsequently codified and with the addition of an introductory section constitutes sections 2318 to 2346, United States Revised Statutes 1878. On 3 March 1873 Congress passed an act providing for the entry of coal lands, and this act is a part of the revision of 1878 following the sections relating to minerals, as sections 2347 to 2352.

Location of Claims — Lode Claims.— The law as codified reserves all lands valuable for minerals from sale except as specially directed, and makes all valuable mineral deposits free and open to exploration and provides that the deposits of mineral and the land in which they are found shall be open to purchase by citizens of the United States and by those who have declared their intention to become such.

The statute provides that upon the discovery of valuable mineral deposits a location may be made upon the surface. Location is made upon or along what is termed the «apex» or the outcrop of the vein or lode. The side lines of the location must be so laid along the strike of the vein as to include the vein within the boundaries of the location, but cannot extend more than 1,500 feet in length and shall not be more than 300 feet on each side from the centre of the vein at the surface. These lines are required to be neither straight nor parallel but may bend or turn with the direction of the vein. No claim shall be limited to less than 25 feet on each side of the middle of the vein at the surface. The end lines must be parallel and straight, or the locator is deprived of a valuable right. The location on the surface may be in the form of a parallelogram, a square, a trapezium or substantially a triangle.

No notice is required to be placed upon the claim but «the location must be distinctly marked on the ground so that its boundaries can be readily traced.» If a State statute or a miners' rule requires a record of a claim, then such record shall contain the name of the locator, the date of the location and such a description of the claim located by reference to some natural object or permanent monument as will identify the claim. Not less than $100 worth of labor shall be performed or improvements made during each year so long as a claim is held without patent. Where claims are held in common or where claims are in a group with a common ownership, the work or improvements required for each may be done upon one claim, or outside of all claims, if it tends to facilitate the development and the extraction of ore from all the claims. The owner of a mining claim may hold his claim indefinitely by the performance of the annual assessment work. If he opens and works a mine, and the work and improvements are equivalent to the required amount, the statute is satisfied. The possessory right under these conditions secures for him the same protection that complete title would. The time for the performance of assessment work or for making the improvements for the first year commences the first day of January of the year following the date of location, and closes with the last day of December of that year. After the end of the year in which the location was made the labor must be performed or improvements made before the end of each year. Upon the failure of a locator to perform the required assessment work, within the statutory period, the claim is subject to relocation; and a valid relocation made of forfeiture gives the relocator not only the right to the possession of the ground, but also to all buildings and improvements placed thereon by the original locator. But if a locator has failed to complete his assessment work before the end of the year and is in the course of its performance, the ground is not subject to relocation. Upon the failure of any co-owner to perform or contribute to the performance of the assessment work, his interest may be forfeited, on notice. A claim that has been abandoned by the locator or owner is open to relocation at any time after the abandonment is complete.

Where two or more veins intersect or cross each other below the surface, the owner of the senior surface location is entitled to all the minerals within the space of intersection, but the owner of the junior location is entitled to a right of way through such point of intersection for the working of his vein below such point. If the two veins unite, the senior surface locator is entitled to the entire vein both at and below the point of union. Authority is given for discovering veins or developing mines by means of tunnels. The owner of a tunnel is given all veins or lodes within 3,000 feet from the face of his tunnel on the line thereof, not previously known to exist, and is protected against discoveries from the surface, if he prosecutes his tunnel construction with reasonable diligence. A State legislature may enact statutes, or the miners of a mining district may make rules and regulations, governing the location of mining claims, the manner of recording and the amount of assessment work, but these must not be in conflict with the United States statutes.

Location and Discovery a Unit.— No time is given by the statute in which to make a location as distinct from the fact of discovery. The statute in effect makes discovery and location a unit, and a location without a discovery is of no force. A vein does not always outcrop on the surface and time may be necessary to discover the required valuable deposit. The statutes of most of the metal mining States have cured this defect in the United States statutes by giving a locator a stated and reasonable time in which to make a discovery after otherwise perfecting his location, and in consideration of this they require the locator to do certain specific work, such as the excavation of a discovery shaft of a given circumference and depth. The purpose of such State statutes is to give the locator time to explore the vein and to find its true strike and thus enable him to lay his claim properly upon the surface. Such requirements are not in conflict with the United States statutes and are valid and recognized as beneficial.

Sufficiency of Discovery.— The statutory test of a valid mining claim is the discovery of valuable mineral deposits; but a prospector is not required to discover a profitable mine in order to validate his location. The statute is satisfied when minerals have been discovered and the evidence is sufficient to justify a person of ordinary prudence in making an expenditure of labor and money with reasonable prospect of success in developing a valuable mine.

Protection of Miner's Possessio Pedis.— A miner not infrequently marks out his surface location without an actual discovery of minerals and to validate his claim by discovery he proceeds to make excavations in the hope of finding the required valuable mineral deposits. In such a case, where a controversy has arisen, the courts have kindly supplemented the mining statute and protected the miner in what is termed his *possessio pedis,* so long as he continued diligently in prosecuting his discovery work. The courts have not limited this *possessio pedis* to the miner's actual working place while seeking a discovery, but hold it to be coextensive with his surface location.

Swinging a Claim.—A locator may on making the explorations required by a State statute discover not only the required mineral deposit but may also discover the true strike of the vein and find that his surface location does not comply with the statutory requirements. In such case he may, within the period given by the State statute, swing his claim in any direction so as to extend along the strike of the vein within a circular area, the diameter of which is equal to the longest distance claimed from the point of discovery, and all conflicting locations made subsequent to the time of his surface location are invalid to the extent of any conflict.*

Extralateral Rights.— Locators of valid mining claims, on continued compliance with existing laws and regulations, are entitled to the exclusive possession of all ground within their surface lines and of all "veins, lodes and ledges throughout their entire depth, the top or apex of which lies inside of the surface lines extended downward vertically, although such veins, lodes, or ledges may so far depart from a perpendicular in their course downward as to extend outside the vertical side lines of such surface locations. But their right of possession to such outside parts of such veins or ledges shall be confined to such portions thereof as lie between vertical planes drawn downward, as above described, through the end lines of their locations so continued in their own direction that such planes will intersect such exterior parts of such veins or ledges."

This right to follow a vein beyond the vertical planes of the side lines of a surface location is known as the "extralateral right." It is sometimes referred to as the "apex" law. The veins of mineral bearing ore in the Western mining regions are usually in the form of thin and broadly extended sheets, standing or resting at a greater or less angle from the perpendicular. The upper edge of this sheet or vein frequently extends to and is exposed at the surface and is variously denominated the "outcrop," "apex" or "top" of the vein. The line of this outcrop or apex as it extends along, or more or less below, the surface is called the "strike" and the downward course of the vein is known as its "dip." Mining operations usually begin at the outcrop, the ore being taken from the vein as it extends downward on its dip. The miner in taking out the ore is given the right to follow the vein on its dip without reference to the side lines of his surface location; but he can only follow this dip within the section of the vein as cut and bounded by the vertical planes of his end lines. The parallelism of the end lines operates to give him the same portion of the vein in following it on its dip. Generally, the veins have an identity and continuity resembling in a degree that of the several roots of a tree and ordinarily can be followed on their dip with the same degree of certainty that a single or separate root of a tree could be followed and taken out.

In no event can a claimant mining out his vein enter upon the surface of another claim in following his vein, but the vein must be followed on its downward course beyond the vertical planes of the side lines as it is mined out under ground and the operations on the surface must be within the boundaries of the surface location. A vein may thus be followed so long as its identity and continuity can be traced and these are questions of fact that a claimant must establish by proof if his right is controverted. If the end lines of a location are not parallel, or if the vein is flat, or what is known as a broad vein, the locator loses this extralateral right.*

Placer Claims.— Placer claims may include all forms of deposit except veins of quartz or other rock in place. In locating placer claims the legal subdivisions of 40 acres may be subdividend into 10-acre tracts. A single claimant may not make a location in excess of 20 acres; but an association of two or more persons may make a location in extent equal to 20 acres for each member of the association; but an association location is limited in any event to 160 acres, this being the largest area that can be embraced in any placer claim. Two or more persons having contiguous claims of any size though less than 10 acres may make joint entry thereof. Placer claims when on surveyed lands shall conform to the legal subdivisions, and no further survey or plat is required. "No such location shall include more than 20 acres for each individual claimant.» The land embraced in a placer claim must be paid for, if patented, at the rate of $2.50 per acre. Where a vein or lode is known to be within the limits of a placer claim, the claimant must, on application for a patent for his placer, include such known vein or lode, or the patent will not embrace such known vein or lode and it is subject to location by any other discoverer, except the width of the lode claim throughout the placer cannot exceed 25 feet on each side of the vein. But a placer patent includes all veins and lodes within its limits that are not known to exist at the time the patent issues.

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* This rule was established by the Supreme Court of Montana in Sanders v. Noble, 22 Mont. 110.

* It is variously charged that the exercise of this extralateral right has been the source of practically all mining litigation in the Western States. But in answer to this charge it has been shown that 2,331 cases have reached the highest courts of the nine leading metal mining States involving all phases of the mining industry, and of these only 71 involved controversies have grown out of the grant of extralateral rights — a percentage of 3.045.

Mill Sites.— The owner of a mining claim worked as a mine may appropriate and patent a tract of non-mineral and non-contiguous land, not exceeding five acres, for a mill site on the same conditions as he may obtain patent for his claim. So the owner of a quartz mill or reduction works not owning a mine in connection therewith may have a patent for his mill site as for a mining claim.

Patent.— If a qualified locator desires a patent for his claim he may file in the General Land Office his application under oath, giving an accurate description with a plat and field notes, showing the boundaries and monuments. He must file proof of the posting and publication of notice of the application and a certificate of the surveyor-general to the effect that $500 worth of labor has been expended or improvements made on the claim. He is required to pay $5 per acre for the land covered by his lode claim. Any person having an adverse claim or superior right to that of the applicant must adverse the application by filing a statement of his claim in the Land Office. Upon the filing of an adverse claim, the adverse claimant must within 30 days begin proceedings in a court of competent jurisdiction to determine his right to the claim. The judgment of the court determines the relative rights of the parties and the successful claimant must present a certified copy of the judgment to the Land Office. A court of competent jurisdiction is within the statute an ordinary State court or a Federal court, if the other necessary jurisdictional requirements are present — such as the proper amount in controversy or diverse citizenship.

By special provision a patent may issue for a mining claim in the absence of an adverse claim, if the locator or if the locator and his successors have held and worked the ground as a mining claim for a period equal to the Statute of Limitations of the State in which the claim is situated. This provision was to obviate the difficulty or impossibility of making the required proof in patent proceedings in cases of claims of long standing.

Mining Statutes Supplemented.— The United States statutes governing the location of mining claims have stood for practically a half century with few amendments and no substantial changes. The defects in the original enactments have not been so pronounced as to induce Congress to attempt their general revision. The several States by permission of these Congressional enactments have adopted local mining codes supplementing and improving the United States laws. Both Federal and State courts in the heart of the mining country and in sympathy with the prospector and the miner have so interpreted these laws as to make them practicable and workable. Under the stimulus of these benign statutes the golden treasure has been mined from the valleys and mountains and the country has been enriched beyond the most fantastic dreams of those who placed these laws upon the statute books. Consult Barringer and Adams, ‹Mines and Mining› (Boston 1897); Clark, H. F., ‹Miners' Manual› (Chicago 1898); Copp, H. N., ‹American Mining Code› (19th ed., Washington 1910); Costigan, Geo. P., ‹Handbook on American Mining Law› (Saint Paul 1908); Lindley, Curtis H., ‹American Law Relating to Mines and Mineral Lands› (3rd ed., San Francisco 1914); Morrison, R. S., ‹Mining Rights› (14th ed., Denver 1910); Snyder, W. H., ‹Mines and Mining› (Chicago 1902); Thompson, J. W., ‹United States Mining Statutes Annotated› (Washington 1915); White, E. J., ‹Law of Mines and Mining Injuries› (Saint Louis 1903).

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MINING AND MILLING MACHINERY. Problems in mining may be classified into groups according to their relation to geology, engineering, machinery and metallurgy; but as the problems of each group overlap to some extent those of the others, the special consideration of the subject of mining machinery necessarily involves a general consideration of mining methods and results in their geological, engineering and metallurgical aspects.

Mining methods differ according to the form and geological relations of the mass of ore or other minerals to obtain which the mining operations are instituted. These relations outline two general methods — those applicable to «surface deposits,» and the more complicated methods required in the working of «underground deposits.»

Surface deposits are those in which the mass of ore is of considerable superficial extent and lies on or near the surface of the ground. The first step in this case is to uncover the ore by «stripping» off the overlying worthless material called the «burden.» If this consists of soft earth or gravel it may be removed with pick, shovel and wheelbarrow, or by the use of steam shovels and small tram-cars drawn by horses, mules or locomotives. If the burden is too hard to be stripped by any of these methods, blasting operations are usually employed. The burden is first blasted off and removed, and the subsequent work of extracting the mineral thus exposed is carried on by benches or terraces along the hillside, so that the cuts will naturally drain into the pit, and the ore will have a favorable grade for its transportation, in removal. If the pit is located in level or depressed ground the use of pumping machinery will become immediately necessary, entailing a heavy expense at the very beginning of the operations. Open cuts are the simplest and most convenient form of excavation, but they expose the men and machinery to the weather, and usually necessitate the abandonment of all operations during the winter. Another method of surface mining consists in the employment of water jets for working auriferous gravels. This is technically known as «hydraulic mining.» Water conducted from great distances and elevations is directed against the ore-bearing gravel banks and beds, in the form of powerful jets through large nozzles called «giants.» The impact of the water under the great pressure due to its heavy fall washes away the gravelly material of the banks with almost incredible rapidity through sluices where the gold is separated from the sand and gravel by amalgamation with the mercury in the riffles of the sluice boxes. The sluices usually consist of a series of 12-foot troughs which empty into one another and often form a line of troughs several hundred feet long. The bottoms of the troughs have corrugations called riffles, and are cut out at intervals and replaced by a grating called a «grizzly.» Under the grizzly another broad trough is placed at right angles to the top trough and empties into another trough which runs parallel to the direction of the top trough and forms the continuation of the main sluice. As the material of the bank is washed through the sluice boxes by a strong stream of water the sand and gravel is caught by the grizzly while the gold passes through into the lower trough where it amalgamates with the mercury which is frequently sprinkled into the riffles.

Underground deposits are worked by the use of shafts and tunnels driven through the overlying earth and rock into the «lodes» or veins of ore. In these operations the overlying rock is always supported in place over those portions of the mines where the borings are used as passageways, and the arrangements for ventilation are more and more carefully made as the workings grow deeper and deeper.

The machinery employed in underground mining is not extensive as to variety. The principal tool is the drill with which is formed the hole for the explosive used to break out the metalliferous rock. To drive the drill the pneumatic hammer is the machine commonly used. In some cases steam is the source of power, but the compressed air mechanism is valued above steam because its exhaust supplies the mine chambers with a continuous supply of fresh air. The air-compressor is commonly located above ground at the mouth of the shaft, the air being brought to the drills by a pipe conduit. In mining native metal, as in the case of virgin copper, a chisel is used, driven by the pneumatic hammer. One of the accessory machines of the mine is the drill sharpener, operated usually by steam. This is an adaptation of the power hammer, carrying a die with which is reforged the cutting edges of the drill heated to cherry-redness. The tempering is done by hand. In most underground mines the water-pump is as much a necessity as in the surface diggings. Hoisting engines are an indispensable part of the outfit and are of various design, adapted to the varying conditions.

The metalliferous rock or ore as broken out by the explosive is prepared for the extraction of its valuable constituent by processes to which the designation «ore dressing» has been given.

Ore dressing consists of two processes — crushing and separation, which employ two distinct types of machinery.

By crushing, the material is broken up into coarse fragments, or ground into a fine powder, and the valuable ore detached from the worthless rock. In some mines the coarse crushing is done underground.

By separation, the valuable ore is concentrated into smaller bulk and weight by being separated from the waste, or in the case of two valuable ores, they are separated from one another. The term «concentration» is specifically used for a separation by mechanical means as distinguished from that accomplished by hand.

The selection of the particular types of crushing and grinding machinery is always determined by the character of the ore and the process of extraction for which the ore is prepared.

The processes of extraction may be briefly defined as follows: (1) Smelting processes in which the pure metal is extracted from its ore by fire; (2) amalgamation process in which the metal forms an amalgam with mercury from which it is subsequently separated by the distillation of the latter; (3) chemical processes in which the metal is dissolved by various solutions and then precipitated in solid form by suitable precipitations; (4) electrolytic processes in which the extraction is accomplished by electrolysis.

The crushing and grinding machinery used in mining consists of the following classes of machines:

Rolls.— These are the standard machines for crushing brittle ores which are being prepared for concentration except where fine crushing is required.

Steam stamps are the standard machines for crushing ores containing native copper.

Gravity stamps are the machines most extensively used for fine crushing.

Tube mills are also quite extensively used for fine crushing and are the most efficient competitors of the gravity stamps, and in many gold mines are used to follow the latter for the finest grinding.

Pulverizers are used for crushing and grinding ore as it comes from the crusher or rolls, for fine concentration or for the recrushing of middlings and tailings from jigs for subsequent treatment on concentrating tables or other concentrating machines.

The preliminary crushing is usually accomplished by jaw or gyratory crushers and then the material is passed over to the rolls, stamps or ball mills. The selection of screens having the proper mesh to crush through is one of the most important details. For purposes of concentration it is usually advantageous to begin by crushing to a coarse size, separating as much of the waste as possible, then recrushing to a finer size and again separating the waste. In crushing gold ores for subsequent treatment by the cyanide process, fine crushing gives a higher extraction than coarse crushing.

The following examples have been selected to illustrate the various classes of these machines:

Fig. 1 shows a general view of a Blake Crusher, a machine of the «jaw-crusher» type. They are made in dimensions which provide a capacity of receiving rocks ranging from 1½ inches by 3 inches to 15 inches by 24 inches in size, which they reduce to fragments ranging from 1 inch to 3 inches in size, at the rate of

15 to 250 tons per 10 hours of work, according to the size of the machines.

They range in power from one-half horse power in those weighing 1,000 pounds to 25 horse power in those weighing 26,000 pounds, and require a speed of 225 to 250 revolutions per minute for their operation.

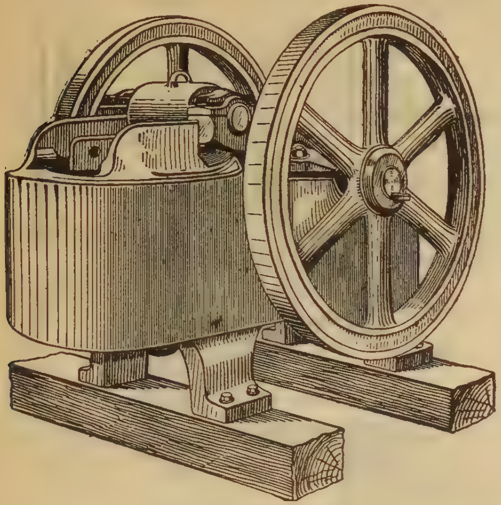

FIG. 1.— Blake Crusher.

Fig. 2 shows a general view of an Austin Gyratory Rock Breaker. It represents one of the strongest and most durable of this class of crushers. It is made in sizes which have receiving openings ranging from 4 inches by 5 inches to 18 inches by 63 inches, and have reduction capacities ranging from 2 to 200 tons per hour, according to the fineness to which the material is reduced and the size of the machine. In weight they range from 3,000 to 100,000 pounds, and require from 4 to 150 horse power to drive them at speeds ranging from 350 to 500 revolutions per minute.

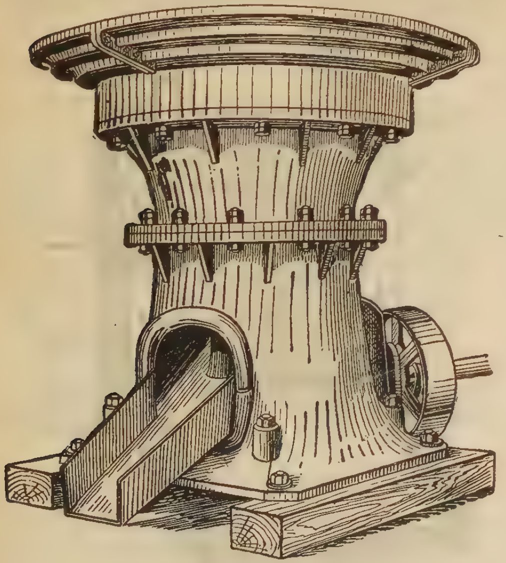

FIG. 2.— Austin Gyratory Crusher.

Fig. 3 shows a general view of a set of crushing rolls. It consists of a set of stationary and a set of movable rolls; an automatic feed hopper built in sections, so that the wearing parts may be easily replaced; a dust cover; and two extra heavy, band wheels for the driving belts. The main frame and the journals for the stationary rolls are cast in one piece. The movable journal is held in the centre of the main frame by means of a heavy steel shaft, and the swinging journals are held in place by tension rods which are attached to nests of powerful coiled springs between washers on the rods. These springs are stiff enough to resist the pressure imposed upon them by ordinary crushing without being compressed, and yield only to abnormal strains caused by the accidental passage through the rolls of uncrushable substances, such as broken drill points, etc. The rolls may be adjusted to a nicety by screwing or unscrewing the nuts on the adjust-

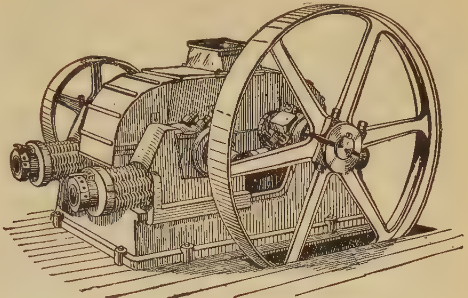

FIG. 3.— Crushing Rolls.

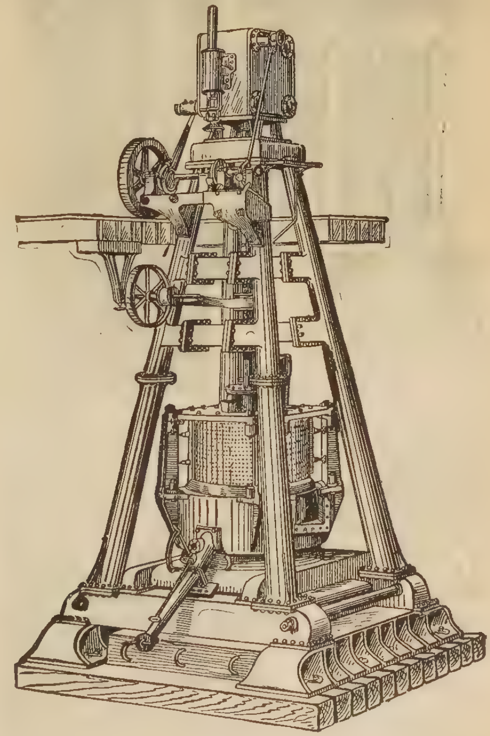

FIG. 4.— Allis-Chalmers Steam Stamp.

ing bolts, which are attached by a «key colter» to the movable journal and are held in place by lock nuts which rest against the heavy brackets cast on the main frame.

The size of rolls ranges from 24" × 15" to 60" × 24", and ranges in weight from 14,000 to 60,000 pounds. Their operative speed ranges from 100 revolutions per minute for the larger and from 100 to 175 revolutions per minute for the smaller machines.

Fig. 4 shows an Allis-Chalmers steam stamp designed for the reduction of copper ores. This stamp is driven by a vertical steam cylinder with valve gearing arranged to keep the steam-port freely open during the downward stroke, thus adding the power of the steam to the weight of the stamp. The mortar has four discharge screens and rests on a heavy anvil or bed plate, and is held in place by angle guide pieces cast upon the massive framing of iron columns. The upper and lower guides for the stamp-stem are detachable bronze bushings in which the stem is slowly revolved by a horizontal pulley on a sleeve between the upper and lower guide brackets. The sleeve contains two feathers which fit into corresponding slots in the stamp-stem, by which the latter is rotated. The steel piston-rod is connected to the steam-stem by a circular disc which is encased in a cast-iron bonnet bolted to the flange of the stem, the space between being filled with pure gum-rubber packing, so as to relieve the shock on the piston and to permit its removal for repairs without disturbing the stamp. These stamps have a capacity of several hundred tons per day. Other forms used chiefly on copper ores are the Kraus Atmospheric Stamp and the Tremain Steam Stamp.

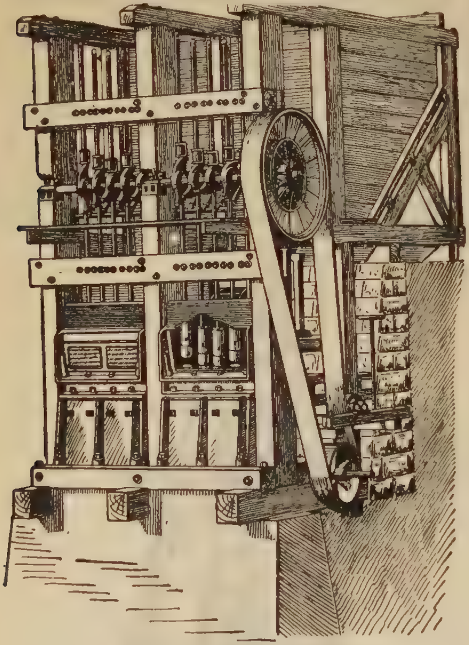

FIG. 5.— Ten-Stamp Battery.

Fig. 5 shows the general aspect of a 10-stamp battery operating gravity stamps. The screen and a portion of one of the sectional mortars is removed so as to reveal the stamps and the dies. Fig. 6 shows a sectional view of the same battery, with automatic feeders in place. From the ore bin down to the stamp die within the mortar the various devices and their movable parts, which comprise the battery, are illustrated by the following figures: Fig. 7, ore-bin gate and spout. These are built in sizes ranging from 18 to 24 inches, or in special sizes as may be required. Fig. 8, a «Challenge» ore-feeder. This is an automatic arrangement which may be used with wet or dry ores. Its operation is simple and regular: The cast-iron plate placed at an angle below the hopper is rotated by bevel gears actuated by a friction device in the shape of a tappet-rod or forked lever, which engages a feed collar placed on the central stem of the

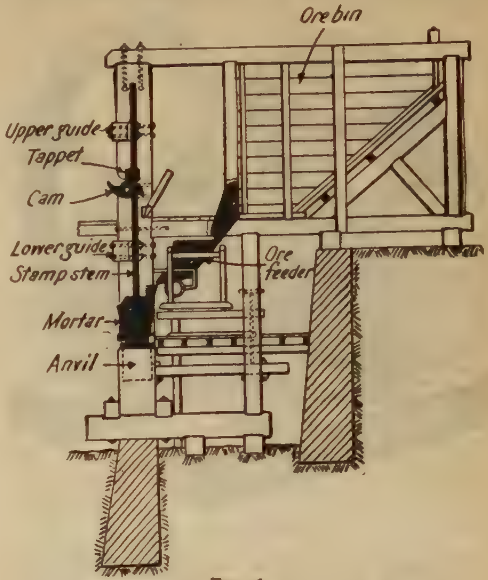

FIG. 6.

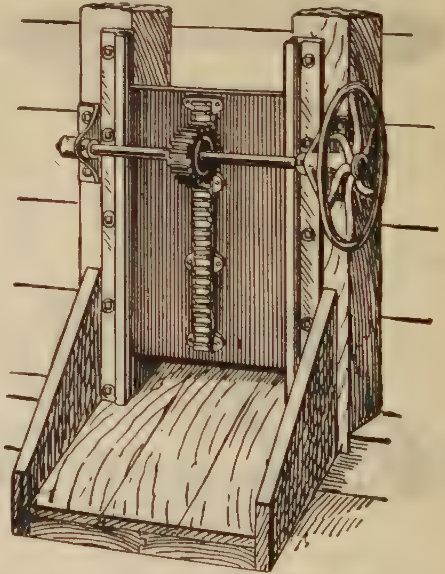

FIG. 7.—Ore-Bin Gate.

battery. The entire apparatus is about 4½ feet in height, 3 feet 9 inches in width and weighs about 845 pounds. Other types of feeders are the «movable suspended,» and the «fixed suspended,» automatic feeders. The principal advantage of using the suspended type of feeder is that it gives an unobstructed floor space behind the battery, and thereby facilitates the work of «clean up,» repairs, etc. When they are used for feeding «Huntington» mills or other pulverizing mills, they are usually arranged to be driven by belting.

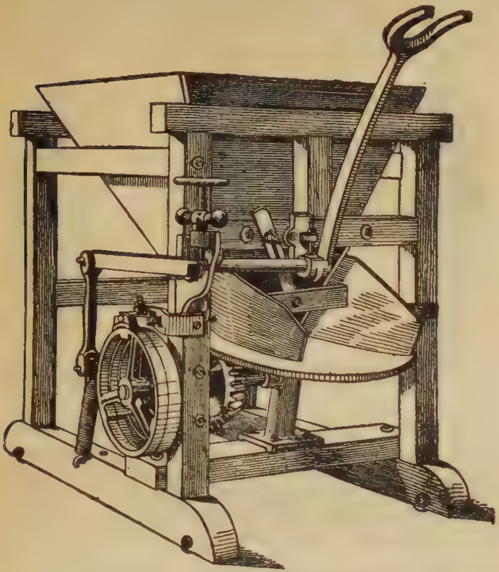
Fig. 8.—"Challenge" Ore-Feeder.

Mortars are made in a great variety of forms, and are designed for both wet and dry crushing. Fig. 9 is an example of the deep single discharge type, designed for copper lining plates in the back and front, the former bolted through the mortar, and the latter attached to a block under the screen frame. The copper plates are coated with mercury. The ore is fed through the opening in the back near the top and is distributed under the stamps by their own action, peculiar to the order of their drop. The water enters at the top against each stamp and carries the crushed ore or «pulp» through the screen as fast as it becomes fine enough, by being dashed up against the screens by the falling stamp. Amalgamation takes place within the mortar by the pulp being splashed up on the copper lining plates. Fig. 10 is an example of a deep straight-back mortar not provided with copper lining plates, amalgamation being effected outside. It is provided with steel lining, and a steel wearing plate, and is so proportioned that it affords unusual facilities for the quick discharge of the pulp through the screen. Fig. 11 illustrates a double-discharge mortar designed for use in wet crushing silver, in concentrating or in combination mills where large crushing capacity is desired. The pulp discharged through the back screen flows toward the centre at the back of the mortar, and passing through an opening in the base of the mortar proper joins the pulp from the front screen. Fig. 12 is an example of the mortars designed for dry crushing. All of them are made double-discharge, with the dies so placed that the dry pulp will easily reach the screens when it is dashed up against them by the action of the stamps. A peculiar feature is the fastening of the die by a dove-tail flange at the bottom. Fig. 13 illustrates a general view and cross-section of a sectional mortar. Its construction in sections adapts it for mule-back transportation in mountainous countries.

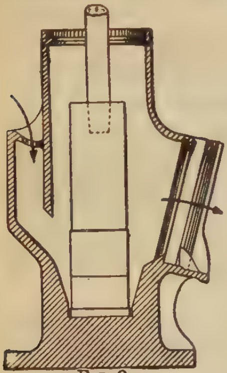
Fig. 9.

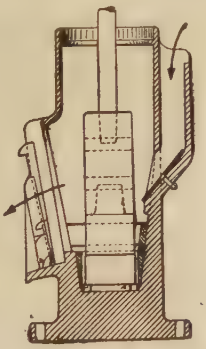
Fig. 10.

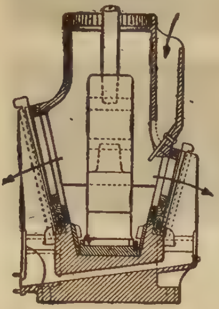
Fig. 11.

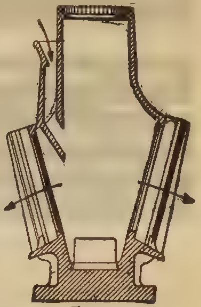
Fig. 12.

It is important to note in this connection that the capacity of a battery of stamps depends very largely upon the construction of the mortors used.

Battery or mortar screens are usually made of genuine Russia iron, or of the best quality of cold rolled homogeneous steel. They are of various patterns — «roundhole screens» with perforations ranging from ¾ to 1 millimeter in diameter; «needle slot screens» perforated with diagonal or horizontal slots usually 15/32 of an inch in length, and ranging from 12 to 70

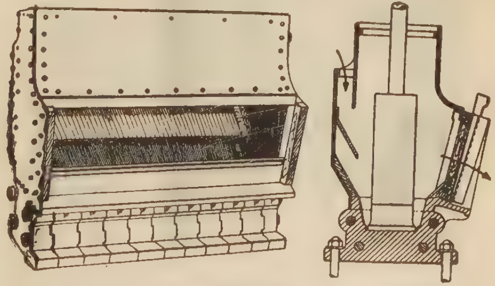
Fig. 13.

mesh; and «indented-slot screens.» Fig. 14 illustrates an example of each type. In addition to these regular patterns, most of the large manufacturers are always prepared to furnish screens punched according to any specifications that may be submitted as may be required for use with particular ores.

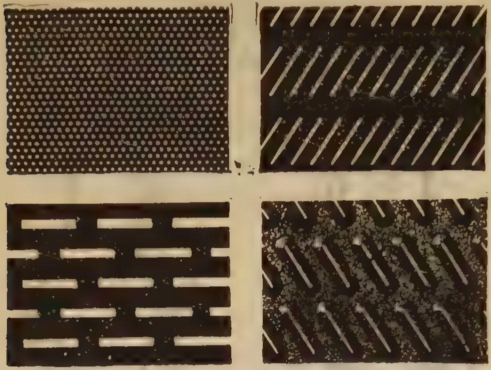

FIG. 14.—Perforated-iron Screens.

Stamp dies are made of very hard and tough material, usually the same as that used for the body of the shoe. Fig. 15 shows six of the principal forms.

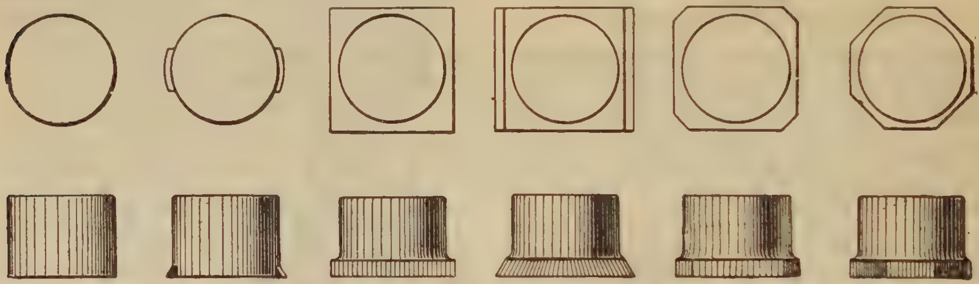

FIG. 15.

Stamp shoes are made in a variety of regular and special patterns. Fig. 16 shows one of the usual pattern. In wet crushing mills it is attached to the stamp-head by means of strips of wood placed in the space between the neck of the shoe and the socket of the head. The wooden strips are swelled by the water and thus hold the shoe and head firmly together. In dry crushing mills strips of iron are used for this purpose.

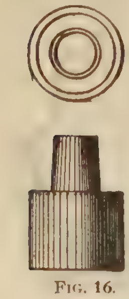

FIG. 16.

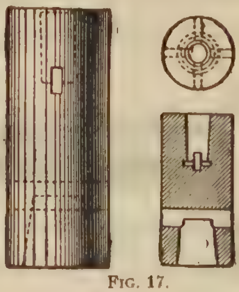

FIG. 17.

Stamp-heads are made the same diameter as the stamp shoes. As shown by Fig. 17, the stamp-head has a tapering socket at each end — the lower for the neck of the shoe, and the upper for the tapering end of the stamp-stem, which requires no other fastening than the wedging action of its taper to bind it firmly to the head. Slots are cut from the outside of the head into the sockets, through which by means of wedges the stem and the shoe can be forced out when necessary.

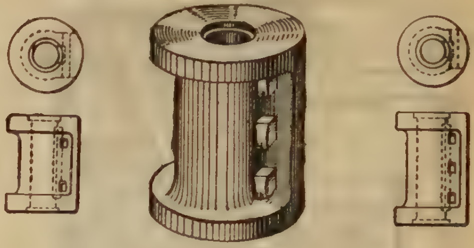

FIG. 18.

The tappets are collars fastened to the stamp-stems. They bear against the revolving cams and thus alternately lift and drop the stamps. Each tappet is fitted with a gib which, being pressed against the stem by cross keys behind, binds the tappet on the stem as firmly as possible, and at the same time admits of a quick adjustment to another portion of the stem whenever necessary. As shown by Fig. 18, they are made with either two or three keys, and are counterbored to prevent slipping on the stem.

Cams are being made in a variety of patterns depending upon the height the stem is lifted and dropped, and the necessary distance between the centre of the cam-shaft and the centre of the stamp-stem. They are made both right-handed and left-handed, and are either keyed onto the cam-shaft, or attached by means of taper-bushings which give a self-tightening effect. Fig. 19 shows side and edge views of both types, and the method of applying the taper-bushings.

Fig. 20 shows their positions on the cam-shaft so as to give the most general order of a drop for a 10-stamp battery, when driven from either end of the shaft.

The other essential parts of the battery are the «cam-shaft boxes,» «cam-shaft pulley» and the «stamp guides.» These are illustrated by Figs. 21, 22, 23, respectively. The cam-shaft boxes are made of metal and in the improved forms are provided with an oil drip launder which extends around the two ends and the front of the box and thus prevents the lubricating grease from dripping into the mortar and onto the amalgamating plates. Standard cam-shaft pulleys are built up of well-seasoned pine, properly laid in oil and spiked. The face and sides are turned and thoroughly covered with oil paint. The hub is of cast-iron, the through sleeve and one flange being cast in one piece. The sleeve is bored to fit the cam-shaft and turned and key-seated to receive the following flange, the two flanges being bolted together with through bolts.

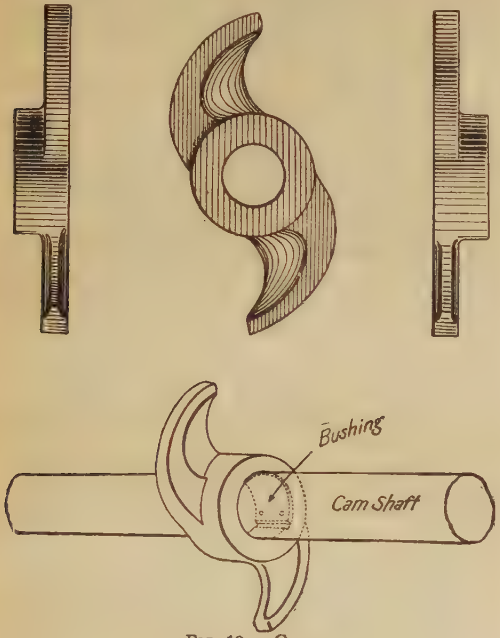

FIG. 19.— Cams.

The stamp guides are made of wood; wood bushings in iron frames; or entirely of iron. They are made either solid or sectional, the latter form being preferable as a considerable saving in time can be effected by their use, especially when the guides require dressing down.

The stamps range from 840 to 1,200 pounds in weight each, and are usually operated through a mean space of six inches at rates ranging from 105 to 110 drops per minute. Their crushing capacity ranges from 6 to 40 tons for 24 hours according to the milling quality of the ore.

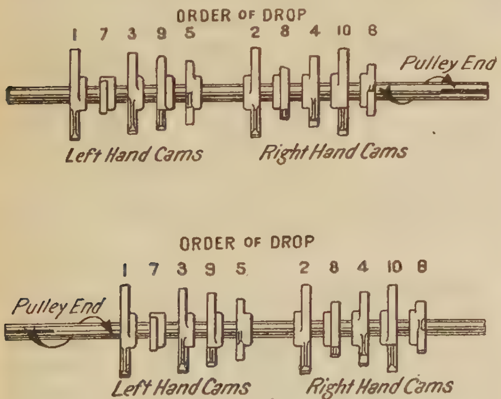

FIG. 20.

Tube Mills.—These are used for the purpose of reducing ores to a fineness up to 200 mesh. Fig. 24 is an example of the cylinder type. Another favorite form is conical or double conical. With the demand for extreme fineness in the cyaniding and flotation processes, as well as for concentration and speedy amalgamation, the tube mill has become increasingly popular, and has been greatly improved by being enlarged as to diameter and shortened. This gives a greater force to the falling balls, and the cost of grinding has been reduced to seven cents per ton of ore, for the larger sizes. The progressive treatment of ore has thus become the Blake or gyratory crusher for the primary work, the stamps, disc crushers or rolls for secondary and the tube mills for finishing — a conical mill for a 90-mesh product for amalgamating or concentrating and a cylindrical mill for a 200-mesh product for the cyanide and flotation processes. One of the advantages of the tube mill is the capability of grinding in any desired size. This type of mill, however, is not an economical crusher for hard quartz ores, but is best adapted to those of moderate hardness. In the case of the hard ores, the stamp mill has

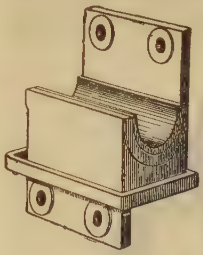

FIG. 21.

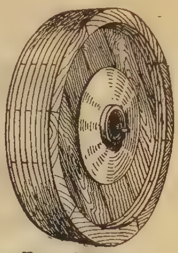

FIG. 22.

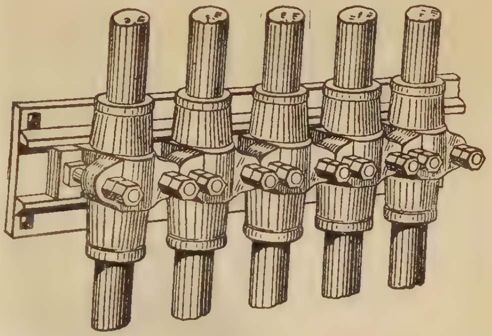

FIG. 23.

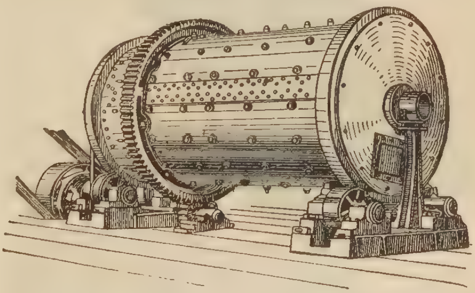

FIG. 24 —Tube Mill.

no rival. In the gold mining plants it is now the practice to use one tube mill for regrinding to each 10 stamps in the battery. The type of mill to be used depends upon the character of the ore; the harder the ore the larger diameter required. In the Marathon tube mill a series of rods from one-half inch to two inches in diameter replace the balls or pebbles of the usual type.

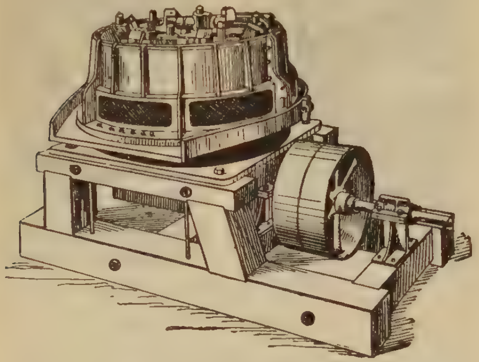
FIG. 25.—Huntington Mill.

Pulverizers.— Perhaps the best representatives of this class of machines are the «Huntington» and the «Chilian» mills. Fig. 25 shows a general view of a Huntington mill of the latest pattern. In operation, the ore and water fed into the mill through the hopper is thrown by the rotating rollers and scrapers against the ring-die where it is crushed to any degree of fineness desired by the centrifugal force of the rollers as they roll over it. The water and pulverized ore are thrown against the screens through which they are discharged when ground sufficiently fine to pass the mesh, which ranges in fineness from 60 to 120. Very little slime results from the operation, and the pulp or pulverized ore is delivered in good condition for concentration. The rollers are suspended so as to leave a space of about one inch between them and the bottom of the mill, thus allowing them to pass freely over the quicksilver and the amalgam without grinding it or throwing it from the mill, while at the same time the agitation of the pulp is sufficient to make amalgamation perfect.

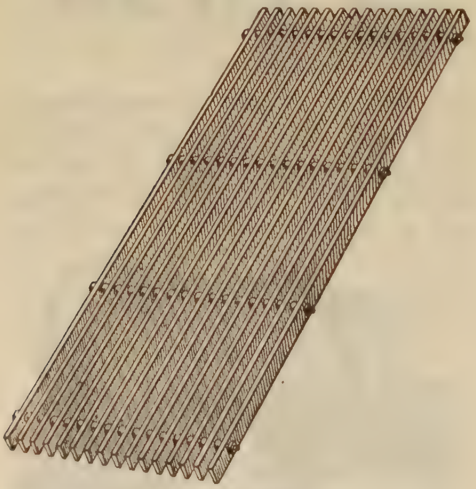
FIG. 26.—Ore-Grizzly.

They are built in sizes ranging from three and a half to six feet in diameter, and from 7,000 to 44,500 pounds in weight. They require from 5 to 15 horse power to drive them at pulley speeds ranging from 120 to 150 revolutions per minute, to give capacities ranging from 10 to 75 tons of ore for 24 hours.

The principal machinery used in the processes of separation are of the following classes:

Preliminary washers, which are employed for the purpose of disintegrating and floating off the adhering fine clayey substances from the coarse particles, by the use of running water aided by some form of stirring device.

Sieves and screens are used for separating the finer from the coarser particles of ore. They are of two classes, (1) «stationary screens,» which include the wire-cloth gravel screens, and the perforated plate screens, and (2) «moving screens,» which include the oscillating bar screens, the plain shaking screens or riddles and the revolving screens or trommels.

Classifiers are used for obtaining a series of products of diminishing size by means of currents of water.

When the process of separation is accomplished by «hand-picking» methods, the work of separating the valuable ore from the waste material is usually done on «tables,» of which there are at least five classes in general use: (1) Stationary horizontal tables; (2) stationary sloping chutes; (3) shaking tables; (4) belt, rope or plate conveyors, and (5) revolving circular tables.

Other methods of separation employ «hydraulic jigs,» which perform their work through the alternating upward and downward action of two currents of water upon a bed of sand supported by a screen; «vanners» or endless belts which are shaken rapidly either endwise or sidewise, and have a continuous slow motion up hill; «bumping tables»; «film sizing tables,» and various forms of magnetic separators.

Fig. 26 shows an ore-grizzly, which represents the various forms of metal bar screens. See AIR-COMPRESSOR; BLOWING MACHINE; POWER TRANSMISSION; PULSOMETER; PUMPS.

Bibliography.— Del Mar, A., 'Tube Milling' (New York 1917); *Engineering and Mining Journal,* 'Who's Who Among Manufacturers of Mining Machinery' (New York 1911); Ihlsen, M. C., and Wilson, E. B., 'Manual of Mining' (New York 1911); Richards, R. H., 'Ore Dressing' (New York 1909); Whitcomb, G. D., 'Mechanical Methods of Mining' (Chicago 1911); Young, C. J., 'Elements of Mining' (New York 1916).

Revised by RICHARD FERRIS.

MINISTER, a high officer of state entrusted with the administration of any department of state government. Collectively, the persons who constitute the administration are called in Europe the ministry, and also the cabinet. The term minister is seldom applied in the United States to members of the cabinet, but is used, as in Europe, to designate diplomatic officers who differ from ambassadors in that the latter hold power as personal representatives of the head of the government. The technical title of ministers is envoy extraordinary or minister plenipotentiary. In Great Britain the term is used to designate the entire body of secretaries which is called the ministry. The executive government of France is divided into 10 departments or «ministries.» See also AMBASSADOR; CABINET; ENVOY; CONSUL; DIPLOMACY.

MINISTER'S WOOING, The, a novel by Harriet Beecher Stowe, first published in serial form in the *Atlantic Monthly* in 1859. The scene is laid in New England, and deals with the habits and traditions of the close of the 18th century. The «minister» in the tale is the famous Samuel Hopkins (q.v.) 1721–1803, the founder of «Hopkinsianism.» The central purpose in this story is to show the sternness and inflexibility of the New England conscience, which clings to the Calvinistic doctrines through all phases of life. The struggle that goes on in the heart of the heroine and her mother when the brother and son, James, is supposed to be drowned and unconverted is a graphic delineation of the moral point of view at that time.

MINIUM. See LEAD.

MINIVER, the Siberian squirrel, which has fine white fur; also the fur itself.

MINK, a circumpolar species of weasel (family *Mustelidæ*), valuable as a fur-bearer, known in North America as *Putorius vison,* and in the Old World as *P. lutreola,* although substantially the same animal. The mink is a true weasel, with 34 teeth and not a marten with 38; but it is of larger size, being 24 to 27 inches long, one-fourth of which belongs to the tail, and has a stouter form and bushier tail, more like the martens. Males are much larger than females. The mink differs greatly from both weasels and martens, and in those points in which it is modified toward this mode of life, namely, the half-webbing of the toes, short ears and close-set, bristly, glistening pelage, it makes an approach toward the others. In color the mink ranges from dull yellowish-brown to a rich blackish chocolate-brown. The ordinary color is a dark reddish-brown, growing blackish on the tail and marked by a white patch on the chin of variable extent. The pelage consists of a dense, soft, matted underfur, mixed with long, stiff, lustrous hairs on all parts of the body and tail. The gloss is greatest on the upper parts; on the tail the bristly hairs predominate. Northern specimens have the finest and most glistening pelage; but the rough treatment given its coat by the animal in scrambling through holes and crevices in rocks, rotten logs and broken ice so rapidly damages its fur that only the pelts taken in early winter show the fur to perfection and yield full value to the trapper. Both sexes are extremely odorous, due to the secretion, equally in both sexes, of a fetid musky scent in small perineal sacs opening near the orifice of the rectum, on each side; the smell is powerful, penetrating and lasting, and is under voluntary control of the animal, but it cannot be discharged like that of the skunk, and is by no means so overpowering. The purpose of this secretion is undoubtedly the attraction of the sexes, and it is used to advantage by trappers as a scent-bait for their traps.

Minks occur in all parts of North America, and are so prolific, so well supplied with food and so secretive that they survive numerously even in the more thickly settled parts of the country. They abound near the coast and in the neighborhood of the larger lakes, rivers and marshes, but are to be found along almost every stream, even in the dryest portions of the interior. The minks cling to the water-courses, where they find plentiful food in the form of meadow-mice, frogs, mussels, fishes (especially eels) and insects. In New England, at least, they feed largely on earthworms, getting them in plenty even in midwinter; and when very hungry, or a good opportunity offers, do not hesitate to attack larger animals, as muskrats — which they are able to pursue through underwater ways into their houses,— rabbits partridges, ducks and poultry. They search the stream-banks for prey, diving and swimming long distances with ease, go about under loose ice and snow, climb rough-barked trees and penetrate crevices and hollows almost with the ease of a serpent, so that nothing is safe from their inquisitive ferocity, and in winter they wander widely.

Their own homes are made in burrows, usually but not always opening in the bank of a stream, and are more often accidental than carefully contrived. In some such retreat the female brings forth in early spring her litter of four or five young, which she guards with great care and courage from all enemies, including the males of her own species. The kittens, and the older ones indeed, exhibit the same playfulness in and out of the water which characterizes otters.

No fur-bearing animal is so unsuspicious of traps and so easily caught as the minks; and they are the victims of boys and amateurs as well as of professional trappers in all parts of the country. The value of the pelts varies with their color, condition, size and the varying demands of changing fashion, but good ones are always of sufficient worth to make them reward the trouble of taking. When captured young they are easily habituated to confinement in suitable pens, and are tamable to a certain degree. They will breed in captivity, and several temporarily successful attempts have been made to rear them in large numbers for the sake of their pelts. They are fed upon fish, coarse meat, etc. The sexes are kept separate except during the month of March, and reproduction begins when the female is one year old. Tame minks make excellent ratters, doing the duty of ferrets.

Consult Audubon and Bachman, ‹North American Quadrupeds› (Washington 1851); Coues, ‹Fur-bearing Animals› (1877); Cram, ‹Little Beasts of Field and Wood› (New York 1899); Stone and Cram, ‹American Animals› (ib. 1902); Hollister, ‹A Synopsis of American Minks› (Washington 1913); Seton, ‹Life Histories of Northern Animals› (New York 1909).

MINK FROG (*Rana septentrionalis*), a small frog inhabiting the northwestern United States. It measures two and one-quarter inches from nose to vent and is dark olive-green above with sooty brown bars and spots and is pure white beneath. In general effect the hue resembles that of the mink, whence its name. Its habits are quiet and solitary. Consult article by H. Garnier in *The American Naturalist* (Vol. XVII, Philadelphia 1883).

MINNA VON BARNHELM. Lessing's ‹Minna von Barnhelm or The Soldier's Fortune,› a comedy of five acts in prose — begun 1763, published 1767 — is most important for the rise of modern German literature since it was the first dramatic work of timely interest growing out of great national events (consult Goethe, ‹Dichtung und Wahrheit› (Book 7). It takes place at a hotel in Berlin about six months after the conclusion of the Seven Years' War (1756–63), and, according to Goethe, purposes to relieve in a simile, as it were, the hostile tension between the defeated Saxons and the victorious Prussians. The Prussian Major von Tellheim desires to be guided above all by his rigid sense of honor, which forbids him to owe his entire good fortune to a woman or to make a woman share in a life which, as far as appearances go, may be exposed to contempt. Minna von Barnhelm, his fiancée, a beautiful and rich young lady of Saxony, fixes her eyes steadily upon Tellheim's sterling character, disregards the opinion of the world and by a well-meant artifice makes him realize that love's highest gratification is to stand by the beloved person in trouble. Minna conquers. True love proves superior to an extreme feeling of honor, although the value of the latter is by no means denied. In ‹Minna von Barnhelm› a deep moral problem is proposed and carried almost to a tragic turn. But the charm of Minna and the naturalness of Franziska and the sergeant captivate the spectator; the rascals are easily seen through, the atmosphere is conciliatory, the jokes to the point. For all this the genuine spirit of comedy is ever present, and ‹Minna von Barnhelm› can maintain its place among the best specimens of the higher type of comedy. Consult edition of Lessing's works in ‹Deutsche National-Literatur› (1882–98, Vol. II); English translation in Harvard Classics, Vol. XXVI; Kettner, G., ‹Ueber Lessings Minna› (Berlin 1896; Kettner, G., ‹Lessings Dramen in Lichte unserer Zeit› (Berlin 1904); von Stockmayr, ‹Die deutschen Soldatenstücke des 18. Jahrhunderts seit Lessings Minna von Barnhelm› (Weimar 1898).

Ewald Eiserhardt.

MINNEAPOLIS, the county-seat of Hennepin County and the metropolis of Minnesota, situated at the Falls of Saint Anthony, on the Mississippi River. On the east the city is contiguous to Saint Paul for half its length, the two being known as the Twin Cities. Minneapolis lies on both banks of the river which crosses it diagonally from northwest to southeast. Passing just above the falls Hennepin avenue divides the portion of the city on the west bank into North and South Minneapolis, and the portion on the east bank into Northeast and Southeast Minneapolis. Nicollet avenue, branching off from Hennepin a block west of the river, runs southwest for a mile and then south to the city limits. Both of these two avenues are broad and well developed, and Nicollet is clear of street-car tracks. Crossing these avenues are numbered streets and Washington avenue, which make the business district. The river is crossed by seven railroads and nine highway bridges, the finest of which is at Third avenue south, a beautiful structure of concrete costing $3,000,000. From the Falls of Saint Anthony south to the city limits the river runs between banks over 100 feet high covered with a great variety of trees and shrubs that present a very picturesque appearance. The total area of the city is 53 square miles.

Manufacturing and Commerce.— Minneapolis was founded by men who sought to utilize the power of Saint Anthony Falls for milling. The lumber industry, at first of prime importance, gave its place to flour milling upon the introduction of patent devices that made it possible to manufacture flour quickly and cheaply; and this industry has increased its importance until it produces nearly $200,000,000 annually, making Minneapolis the chief flour milling city in the world. The annual output is over 17,000,000 barrels. By its situation near the great American grain fields the city has become the greatest primary wheat market in the world, its elevators having a capacity of 52,500,000 bushels. In 1917, 181,898,480 bushels of grain were received by the mills and elevators of the city. The second industry of importance is the manufacture of machinery, especially of gas tractors and other farm implements. This industry with allied iron and foundry work amounts to $25,000,000 annually. The city is the shop headquarters of three railroads, the Chicago, Milwaukee and Saint Paul, the Minneapolis and Saint Louis and the Soo Line. The third industry is that of lumber, with sash and door manufacturing, cooperage and other woodworking crafts. Although the city does not now rank high as a lumber milling centre, it is still first in sash making; and on account of its early pre-eminence it remains the chief lumber market in the United States, being the meeting ground of Eastern buyers and representatives of the great coast companies. The fact that Minnesota still leads in the manufacture of white pine lumber and contains numerous wood-pulp plants besides cutting 500,000,000 feet of various kinds of lumber annually also contributes largely to the importance of Minneapolis as a lumber centre. The total value of the annual woodworking product is $12,000,000. The fourth industry is the making of linseed-oil and meal. This has grown rapidly during the last decade until it produces $12,000,000 annually. The proximity of Minneapolis to the flax fields of Minnesota and the Dakotas, makes it the natural centre of this trade. Besides these activities there is a diversification of manufacturing that has steadily increased during the past decade — food products of many kinds, including bakery goods, ice cream and confectionery, clothing, especially knit goods and laborers' wear, blank-books and other publishers' products and a wide variety of articles used in the construction of buildings, bridges, elevators, automobiles and electrical machinery. In fact the outstanding feature in the history of manufacturing in Minneapolis is the growing diversity of industry. In 1890 there were in the city 384 firms producing an annual value of $78,617,170, of which $39,000,000 was reported by the flour and lumber industries. In 1917 there were 1,512 firms producing $275,000,000, of which $200,000,000 was the value of flour and lumber. During the past 10 years the value of Minneapolis manufacturing has increased 55 per cent, and the city has become the 14th in rank of manufacturing in the United States. With Saint Paul, Minneapolis shares in a jobbing and wholesale trade that covers a very large territory, including Wisconsin, Iowa, North and South Dakota, Montana, Wyoming and Canada. Considerable business from the Pacific coast comes to the Twin Cities. In 1917 for Minneapolis alone this wholesale and jobbing trade amounted to over $300,000,000. Besides general merchandise this business includes drugs, hardware, machinery, building material, lumber, paper and automobiles.

Power and Transportation.— For this manufacturing there is available 40,000 horse power from Saint Anthony Falls. Saint Croix Falls, 70 miles distant, supply 30,000, and Coon Creek, on the Mississippi, 20 miles north of the city, 15,000. A new government dam in the Mississippi near Minnehaha, constructed to make the river navigable to Minneapolis, it is estimated will produce another 40,000; and other projects yet undeveloped promise considerable more electric power. The city is well connected with the great coal docks at Duluth, so that its industries can easily use steam as well as electric power. Altogether the city uses in all of its industries over 90,000 horse power. By virtue of its position the city early became a railroad centre. The Chicago, Milwaukee and Saint Paul; Chicago, Saint Paul, Minneapolis and Omaha; Chicago, Burlington and Quincy; Chicago and Rock Island; Chicago and Great Western; Minneapolis and Saint Louis; Minneapolis, Saint Paul and Sault Sainte Marie operate some of the finest trains in the world between Minneapolis and Chicago, and provide for the shippers of Wisconsin, Iowa and Minnesota. With the grain fields of the Dakotas and with the Pacific Coast States the Great Northern, Northern Pacific, Soo Line and Chicago, Milwaukee and Saint Paul make excellent communication. Duluth, the tonnage of which is not exceeded by that of any port in the world, is closely bound to Minneapolis by four of these lines. A system of trolley lines is being developed that promises to greatly increase the trade of the city with its immediate territory. The completion of the government dam in the Mississippi, that makes Minneapolis the head of navigation on the river, has already persuaded the city to construct its own wharves suitable for the landing of freight from barges.

Finance.— The city has four national, 33 State, four savings banks and three trust companies. In these the total capital invested is $16,560,000; the total deposits, $194,463,611. In 1917 the bank clearings amounted to $1,662,078,303.37. The city is the centre for the Ninth Federal Reserve District. It is connected on the one hand with the rural banks of the great agricultural territory of the Dakotas, Montana, Minnesota and parts of Iowa and Wisconsin that are tributary to Minneapolis, and on the other with the powerful financial institutions of the East. Thus it not only serves to finance the crop moving, but also to guide capital to the best investment. The Minneapolis banks have done a great deal to forward education among the farmers of the Northwest, especially encouraging expert training in agriculture.

Revenue.— The total assessed valuation of Minneapolis is $216,000,000, the total taxable wealth $864,000,000. This produces a revenue of $8,640,000, of which $2,226,188 is spent for current expenses; $2,898,500 for education; $1,002,188 for interest; $587,799 for police protection; $542,540 for parks; $500,000 for fire protection and $329,700 for library equipment and support. The bonded indebtedness of Minneapolis is $29,000,000; and for the retirement of bonds an annual allowance, or sinking fund, of $635,000 is provided. Miscellaneous expenses make up the total budget. It should be understood that the Tax Law of Minnesota provides that assessments be made on a 40 per cent valuation of all property. On this basis the total taxable wealth of the city is $864,000,000. In addition to the rate for city purposes a State and county tax amounting to nine mills is levied, so that altogether $10,584,000 is raised within the city.

Buildings, Parks, etc.— In the late eighties many handsome buildings were erected, including the Public Library, Guaranty Loan (now Metropolitan Life) Building, West Hotel and several churches, notably the First Baptist. The city hall and courthouse, begun in 1887 and finished in 1909 at a cost of $3,000,000, post office, Security Bank, McKnight, First National-Soo Line, Plymouth and Metropolitan Bank buildings and the Andrews, Dyckman, Leamington and Radisson hotels are good types of modern architecture. The Art Institute, Immaculate Conception Procathedral, Plymouth (Congregational), Hennepin Avenue, the costliest Methodist church in the world, and Saint Mark's Procathedral, said to be the best example of pure Gothic in the United States, are recent additions to the beauty of the city. The great variety of landscape has made possible the building of many houses of fine architectural design. The city has taken advantage of its variety of scenic features in its planning of an extensive park system. Altogether there are 3,820 acres in the system, of which 1,211 are water. The largest park is Glenwood, containing 586 acres. Other popular resorts are Lake Harriet, Minnehaha Falls and Riverside, the last named of which is being enlarged to include land bordering on the lake formed by the widening of the Mississippi above the new government dam. One unique feature of the system is the connection by canals of Brownie, Lake of the Isles, Cedar and Calhoun lakes making possible a canoe or launch trip of nine miles. Another is the Grand Rounds, a system of boulevards bordering the lakes on the western boundary, crossing the Mississippi near the northern city limits, paralleling Shingle Creek, and descending to enter Glenwood Park on the western edge of the city, completing thus a circuit in which every possible variety of landscape, save ocean view, is presented. From the centre of the city the Grand Rounds is entered through the Parade on the west, and through the grounds of the University of Minnesota on the east, of the river. In all there are 55 miles of drives. In the past decade recreational facilities have been greatly increased to accommodate all classes of people, until now the city supports golf, tennis and other pastimes in 39 playgrounds, canoeing, bathing and skating. Calhoun Beach accommodated 166,830 persons during the season of 1917 and other lakes 130,000. The board also provides for fishermen and maintains a regular launch service. It conducts 35 ice-skating and hockey rinks. Minneapolis owns its own water system, including a filtration plant valued at $1,000,000. It has 580 miles of water main, 409 miles of sewers, 135 miles of straightway and 255 miles of 27 feet paving. Of its 881 miles of streets only 94 are still ungraded. The streets lighted by electricity total 469 miles, those lighted by gas, 96. All lighting, except for the two wards adjacent to the municipal garbage consumer, is done by private ownership; and the street car service is similarly conducted. On account of the absence of steep grades and natural obstructions to traffic it has been relatively easy to provide the city with through lines that materially reduce the cost of operation and keep the service uniform. A five-cent fare with transfer privileges prevails. Four lines connect the centre of the city with that of Saint Paul.

Education.— Minneapolis has 50,000 pupils in her public schools. There are 75 buildings worth $8,200,000. Six of these are high schools and three junior high schools. The high school enrolment is 7,000. Parallel to the work for girls in the Girls' Vocational High School is that for boys in the Dunwoody Institute, a privately endowed institution, co-operating with the public school system. There are 1,700 teachers in the public schools subject to automatic salary increase and retirement on pension. Stanley Hall and Northrup Collegiate School, for girls, and Blake School for boys prepare for college. Saint Margaret's Academy, De La Salle Institute (Catholic), Minnehaha Academy and Minnesota College (Lutheran) are prominent in the educational life of the Northwest. The city is the seat of the University of Minnesota and of Augsburg Seminary. Besides these institutions the Minneapolis School of Music and Dramatic Art, the Northwestern Conservatory of Music, the McPhail School of Music, the Minneapolis School of Fine Arts and the Handicraft Guild (affiliated with the University of Minnesota), together with several business colleges and other technical schools, provide instruction for several thousands of students. The Public Library, its 17 branches, 20 stations and 437 distributing points, circulated 1,566,000 volumes in 1917 in addition to over 125,000 pictures, lantern slides, pieces of music and other material. It owns 334,763 books. Minneapolis has made great progress in the arts, especially during the past 15 years. The Minneapolis Symphony Orchestra, the Philharmonic and Apollo clubs and the Thursday Musical with the various conservatories, and 400 music teachers whom the advantages of the city as a musical centre attract to Minneapolis are chiefly responsible for giving the city its leadership. The choral work in the public schools is of a high quality. The Institute of Art, one unit of which was completed in 1913 at a cost of $500,000, with the art schools and the art departments of the public schools exerts a great influence in the building and decorating of the Northwest. The Walker Art Gallery is well known for its collection of originals.

Government.— Minneapolis is governed by a mayor, who appoints a chief of police, and by a council of 26 aldermen, two from each ward, elected alternately for a term of four years at the time of the State elections. The council chooses an engineer, attorney, fire chief and health officer. The schools are under the charge of a board of seven, each elected from the city at large, for a term of four years. The board elects a superintendent and business superintendent, appoints teachers and other employees, not under civil service provisions, and administers affairs in general. The park and library boards are similarly independent of council control, but the mayor is ex officio a member of both. The board of corrections and charities controls the poor department, municipal lodging-house, city workhouse and four hospitals. The civil service commission examines candidates for clerkships and other positions. The board of tax levy, consisting of the mayor, president of the council, chairman of the council ways and means committee, city comptroller, the presidents of the school, library and park boards, the chairman of the board of commissioners of Hennepin County and the county auditor, at a meeting held on the second Monday in September fixes the rate to be levied in the city and county. The city treasurer and comptroller are elected by the people as are also municipal judges. All candidates for office run on a non-partisan ticket, at a primary election held in June, the two candidates for each office receiving the highest number of votes being declared nominees to contest at the general election on the first Tuesday after the first Monday in November of the even-numbered years. The city has a patrol limit system that confines saloons to a restricted district in the centre of the city and within certain other boundaries.

History.— Minneapolis is built about Saint Anthony Falls which Father Hennepin, the first white man to view them, so far as is known, named in 1680. No settlement was made until the establishment of Fort Snelling, first called Fort Saint Anthony. Then in 1821 the government built a mill to saw lumber on the west bank of the river just below the falls. Later this mill also ground flour. Settlers, however, were rigorously excluded from the Fort Snelling reservation until after the Indian lands east of the Mississippi had been relinquished. This was in 1837. The following year squatters from the fort built log cabins on the east bank of the river in attempting to claim the water-power rights as soon as the government should permit settlement. It was not until 1848 that Franklin Steele and William Cheever laid out the village of Saint Anthony. The former also built a sawmill to cut the pine that Daniel Stanchfield and other Maine woodsmen, whom news of the inexhaustible supply had attracted to the settlement, sent down the river; and the village grew rapidly to importance, becoming a city in 1855. The pioneers were interested in education and general upliftment as well as in material things; and it was one of their first moves to found a university, which after a period of hardships became the University of Minnesota, and to establish lecture courses and lyceums. In 1851 Col. John Stevens, acting for Steele, crossed to the west bank and laid claim to a quarter section of land, upon which the business portion of Minneapolis was later built. He gave lots to those who would build; and in consequence many settlers were attracted. A ferry, first, and then a suspension bridge, served as the connecting link between the two villages. In 1855 the plot of the western set-

COURT HOUSE AND CITY HALL, MINNEAPOLIS

tlement was validated by the government; and from then on it began to lead, taking the name, Minneapolis, a compound of the Indian Minnehaha (Curling Water), and the Greek, polis (city), upon a suggestion of Charles Hoag, a schoolmaster and public-spirited citizen. In 1867 it became a city. In 1872 the two cities became one under the name Minneapolis.

With the advent of the railroad and the period of prosperity that followed the Civil War, the city grew rapidly. It was stimulated by the installation of the Swiss Roller System in place of the buhr stone with which the first flour-mills were equipped and by the introduction of a bolter process that purified middlings, thus making it possible to save as flour that which had formerly been wasted. These two inventions, the construction of an apron to prevent the wearing away of the limestone ledge of the falls, and the completion of sluiceways, made it possible to produce flour swiftly and cheaply so that Minneapolis became known as the Flour City. At the same time the cutting of lumber kept increasing until 1890 when 500,000,000 feet were produced. At the Republican National Convention in 1892 Minneapolis was justly advertised as the chief lumber and flour city in the world. After a brief period of comparative inactivity caused by the panic of 1893 and the depression that followed, the city began to attract new ventures of various kinds and to reflect their influence on the Northwest as suggested in the discussion of her trade. The growth in population has been as follows: (1860) 5,000; (1870) 18,079; (1880) 46,887; (1890) 164,739; (1900) 202,718; (1910) 301,408; (1920) 380,582.

Bibliography.— Hudson, H. B., ‘A Half-Century of Minneapolis’ (Minneapolis 1905); id., ‘Dictionary of Minneapolis’ (ib 1917); Parsons, E. D., ‘The Story of Minneapolis’ (ib. 1913); Reports of the city departments; pamphlets of Minneapolis Civic and Commerce Associations.

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MINNEAPOLIS, Kan., city, county-seat of Ottawa County, on the Solomon River and on the Atchison, Topeka and Santa Fé and the Union Pacific railroads, about 130 miles west of Topeka. It is in an agricultural and stock-raising region. Its chief industrial establishments are flour-mills, grain elevators, foundry, carriage shops and creamery. Stone quarries in the vicinity contribute to the industries of the city. Pop. 2,000.

MINNEAPOLIS SYMPHONY ORCHESTRA, founded in 1903, consists of 80 players, all under regular salary. The orchestra is maintained by a guarantee fund. The conductor, Emil Oberhoffer, has had charge of the orchestra since its organization. The standard of programs and performance are high and the orchestra ranks with the best musical organizations of the United States.

MINNEDOSA, Canada, town 135 miles northwest of Winnipeg, in the Marquette Electoral Division, Manitoba, and on the Little Saskatchewan River and on the Canadian Pacific Railway. Minnedosa, being a railway centre, is growing rapidly. It is in a fine agricultural country and possesses a sash-factory and a grist-mill. Pop. (1921) 1,479.

MINNEHAHA, mĭn-ĕ-hä'hä, **Falls of** (Sioux, *Mini-haha,* «curling water»), a cascade in the Minnehaha River, now in the Minnehaha Park, which belongs to Minneapolis, Minn. The cascade has a fall of about 60 feet and is in a picturesque glen which extends to the Mississippi River. Just below the falls the river is spanned by a rustic bridge. The name has become world-known through Longfellow's ‘Hiawatha.’

MINNESINGER, min'ĕ-sĭng-ėr, or **MINNESÄNGER** (from old German *minne,* love), the name given to the German lyric poets of the 12th and 13th centuries on account of love being the chief subject of their poems. The cradle of German lyric poetry was Upper Austria. The earliest German poetry was chiefly narrative, and this not only when past events formed the poet's theme, but also when he celebrated present occurrences. But this contact with the present naturally gave occasion to the expression of the poet's feelings and gradually led to the lyric pure and simple. Such was the origin of the oldest extant poems of Dietmar von Aist (1143–70) and others. But the development of German lyric poetry was greatly hastened by the influence of the French poetry of the same class, which at that time flourished in Champagne and Flanders. The immediate effects of this French influence were greater strictness and variety in the versification, a greater preponderance of the subject of love and a more purely lyrical treatment. The minnesingers were generally of noble birth, and like the troubadours who preceded them wandered from place to place. The Westphalian Heinrich von Veldeken, afterward regarded by the minnesingers as the true father of their art; Friedrich von Hausen, a native of the Palatinate; the Thuringian Hugo von Salza; the Saxon Heinrich von Morungen; the semi-mythical Heinrich von Ofterdingen; and the two Swabians Heinrich von Rucke and Ulrich von Gutenburg, were the chief minnesingers of the latter half of the 12th century. The 13th century witnessed the highest cultivation of the minnesong, and also the beginning of its decay. Its greatest masters are Walther von der Vogelweide, Wolfram von Eschenbach, Gottfried von Strassburg and Hartmann von Aue. After the art had ceased to be practised by the minnesingers, it was taken up by the artisans of the towns under the name of meistersingers (q.v.).

MINNESONG (German *Minnesang, Minnegesang,* from *minne,* «love,» and *sang,* «song»), a mediæval type of German love-lyric, written chiefly by knightly poets in the 12th, 13th and 14th centuries, in the Middle High German dialect. The earliest of the 300 or more names of minnesingers that have been preserved are Kürnberger, Memlo von Sevelingen, Dietmar von Aist, etc., but only about 160 of them have left poems that are still accessible. Some groups of minnesingers were very distinctly under the influence of French (Provençal) and Italian models, such as Friedrich von Hausen, Rudolf von Fenis, Ulrich von Gutenberg, Heinrich von Rugge und von Morungen, etc. The flower of the type blossomed in Walther von der Vogelweide and Reinmar von Hagenau about the year 1200, coincident with the great mediæval German epic, the ‘Nibelungenlied.’ Most of these songs were intended for musical performance and are divided into classes, distinguished by the names lied, leich and spruch. Rüdiger Manesse (d. Zürich 1325) and his son are said to have collected them in the Great Heidelberg Manuscript, which was taken to Paris in the course of the Thirty Years' War, and later returned to Heidelberg. It contains 137 miniatures and over 7,000 strophes; published by von der Hagen (Leipzig 1838), Pfaff (Heidelberg 1899), Mathieu (Paris 1850). But many poems not in the Manesse manuscript are found in other manuscripts. Later minnesingers, such as Ulrich von Lichtenstein, began to regard the occupation of producing such poems as a sort of sport or handicraft and the art passed out of the hands of the lower nobility into those of the burgher «masters» (see MEISTERSINGERS) and roaming minstrels. Consult Lachmann, K., and Haupt, M., 'Minnesangs Frühling' (Leipzig 1884); Lyon, O., 'Minnesang und Meistergesang' (Leipzig 1883); Grimme, F., 'Geschichte der Minnesinger' (Paderborn 1897).

JACOB WITTMER HARTMANN.

MINNESOTA (Dakota, «sky-tinted water») is bounded on the east by the Mississippi River, the Saint Croix River and a line running north from near the western bend of this stream for 40 miles to a point near the extreme western end of Lake Superior, and by the curving northwest shore of the lake. These boundaries separate Minnesota from the State of Wisconsin. On the north the State is separated from the province of Ontario in Canada by the Pigeon and Rainy rivers, by a line passing northward and westward through Lake of the Woods, then southward to the 49th parallel which, for 100 miles until it is intercepted by the Red River of the North, forms the boundary between Minnesota and the province of Manitoba. The Red River from its source in Lake Traverse and a line running southward from the Big Stone Lake, separated from Lake Traverse by a mile of land, to the northern boundary of Iowa, divides Minnesota from North and South Dakota on the west. The line between Minnesota and Iowa, on the south, is 275 miles long. Within these boundaries the State has an area of 87,196 square miles, of which 6,338 is of water. It is 408 miles long from north to south, and from 357 miles, the distance from the Red River to Pigeon Point, on Lake Superior, to 180 miles, the distance from Big Stone Lake to Saint Croix Falls, or an average of something over 200 miles wide.

Topography.— The most important fact about the surface of Minnesota is that its north-central part forms the divide from which water flows northward to Hudson's Bay, eastward by way of the Saint Lawrence River to the Atlantic and southward through the Mississippi to the Gulf of Mexico. This divide is the old Laurentian highland which slopes steeply to Lake Superior, gently to the south and west. Two-thirds of the State is a rolling plain, well drained and easily cultivated. The average elevation is 1,275 feet, this figure involving calculations of such low altitudes as 616 feet in the southeastern part of the State and the heights of the Mesabe Range and the Sawteeth Mountains in the northern part, the greatest of which attains 2,200 feet. The valley of the Red River is 800 feet above sea-level and the Twin Cities have the same altitude.

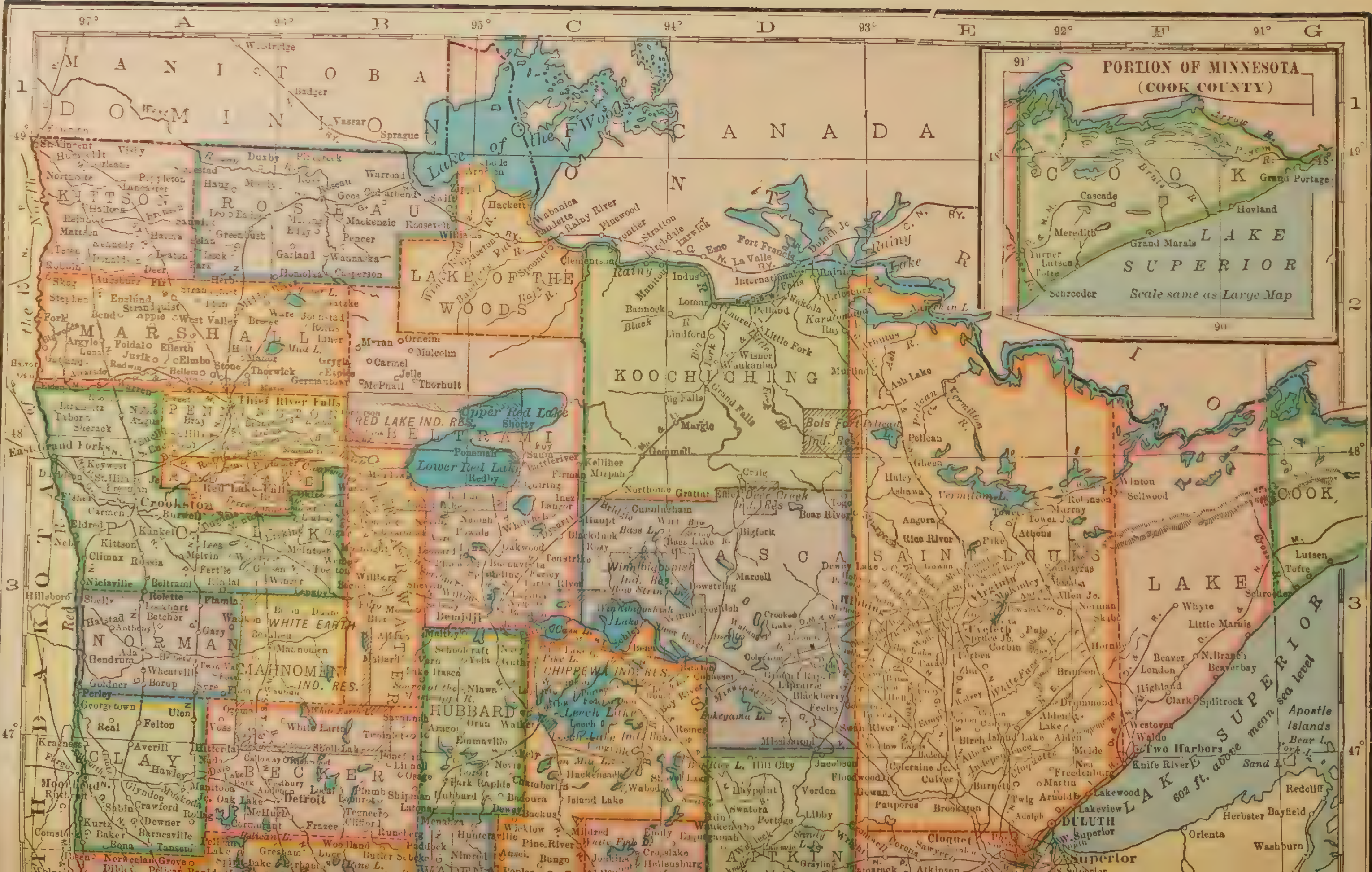
Rivers and Lakes.— The early explorers found in Minnesota wonderful canoe highways. From Lake Superior they could ascend the Saint Louis River, then cross over to the Mississippi, by which, with short portages, they could easily reach the Red; or they could descend the Mississippi, carry around the Falls of Saint Anthony, enter the Minnesota, ascend to Big Stone Lake, carry to Lake Traverse and enter the Red from that direction. Again they could enter the Saint Croix at its confluence with the Mississippi and ascend to the Wisconsin divide, on the northern slope of which they found numerous streams leading to Lake Superior. With the exception of a portage the way from Lake Superior to the Red River was open along the northern boundary and it was easy to get from the Minnesota River into the Des Moines River, and thus travel through what is now the State of Iowa. Each of the larger rivers is fed by numerous goodly tributaries — the Mississippi by the Crow Wing, Rum, Minnesota, Saint Croix, Cannon, Zumbro and Root; the Minnesota by the Blue Earth, Cottonwood, Redwood, Chippewa, Pomme de terre and Lac Qui Parle; the Red by the Red Lake and Wild Rice; the Rainy by the Vermillion, Big Fork and Little Fork; the Saint Croix by the Little and the Snake. All of these are wholly within the State. The Mississippi and Minnesota, with their branches, drain 48,700 square miles of territory; the Red, 15,100; and the Rainy, 10,300. The Missouri drains about 1,700 square miles.

There are innumerable lakes in the State, with a total area of 3,000 square miles. They range in size from a few acres to the great expanses of Red Lake, 400 square miles; Leech Lake, 200, and Mille Lacs, 200, and include such resorts as Minnetonka and White Bear, near the Twin Cities, Vermillion, 90 miles north of Duluth, the Otter Tail and the Chisago lakes. Within the limits of Saint Paul and Minneapolis there are 13 lakes of notable size and excellent beaches. No portion of the State, except the extreme southeastern and the lower Red River Valley, lacks the advantages for recreation afforded by a good lake.

Climate.— Stories of Minnesota climate are based on the extraordinary experiences of explorers and settlers rather than on the weather records; but even these experiences show a wide divergence. For instance Le Seuer's secretary reports that in 1700 the rivers were frozen in September, and Carver declares that the winter of 1766 was so warm that he could live in the open without discomfort. Plowing has been accomplished in February and snow has blocked trains in October. It is of record that the mean annual temperature of the southeastern part of the State is 46° F., at the Twin Cities 44° and 36° in northern Minnesota. The coldest month is January, during which the mean temperature is 14° in the southeast, 12° at Saint Paul and 0° in the north. July is the warmest month, the temperature varying from 76° in the southern part, 74° at Saint Paul and Minneapolis to 68° in the north. It is seldom that extreme temperatures prevail for more than a day or two at a time and the State has been remarkably free from destructive storms. In fact since its settlement in the fifties only four dangerous tornadoes and three blockading snows have occurred. The rainfall is 22 inches

MINNESOTA

Ada, (A3)	1,411
Adams, (E7)	609
Adrian, (B7)	1,087
Afton, (E6)	183
Agder, (A2)	130
Aitkin, (D4)	1,490
Akely, (C3)	855
Albany, (C5)	824
Alberta, (A5)	109
Albert Lea, (D7)	8,056
Albertville, (D5)	250
Alborn, (E3)	130
Alden, (D7)	530
Aldrich, (C4)	100
Alexandria, (B5)	3,388
Alma City, (D7)	130
Almora, (B4)	150
Alpha, (C7)	261
Altura, (E6)	189
Alvarado, (A2)	361
Amboy, (C7)	527
Amiret, (B6)	125
Annandale, (C5)	644
Anoka, (D5)	4,287
Appleton, (B5)	1,579
Arago, (B3)	100
Arco, (A6)	231
Argyle, (A2)	956
Arlington, (C6)	776
Ashby, (B4)	388
Askov, (E4)	242
Atkinson, (E4)	320
Atwater, (C5)	735
Audubon, (B4)	314
Aurora, (E3)	2,809
Austin, (E7)	10,118
Automba, (E4)	100
Avoca, (B7)	270
Avon, (C5)	709
Backus, (C4)	297
Badger, (A2)	394
Bagley, (B3)	814
Baker, (A4)	150
Balaton, (B6)	664
Banning, (E4)	44
Barnesville, (A4)	1,564
Barnum, (E4)	242
Barrett, (B5)	358
Barry, (A5)	107
Battle Lake, (B4)	628
Baudette, (C2)	960
Beardsley, (A5)	507
Beaulieu, (B3)	150
Beaver, (E6)	100
Beaverbay, (F3)	170
Beavercreek, (A7)	217
Becker, (D5)	210
Bejou, (B3)	150
Belgrade, (C5)	487
Belleplaine, (D6)	1,251
Bellingham, (A5)	405
Beltrami, (A3)	219
Belview, (B6)	381
Bemidji, (C3)	7,086
Bena, (C3)	205
Benson, (B5)	2,111
Benton, (D6)	46
Bertha, (C4)	444
Bethel, (D5)	265
Bigelow, (B7)	223
Big Falls, (D2)	325
Bigfork, (D3)	160
Big Lake, (D5)	361
Bingham Lake, (B7)	273
Bird Island, (C6)	976
Biscay, (C6)	175
Biwabik, (E3)	2,024
Blackduck, (C3)	788
Blakeley, (D6)	230
Blooming Prairie, (D7)	1,012
Blue Earth, (D7)	2,568
Bluffton, (B4)	220
Borup, (A3)	250
Bovey, (D3)	1,324
Bowlus, (C5)	247
Boyd, (B6)	549
Braham, (D5)	511
Brainerd, (C4)	9,591
Brandon, (B5)	292
Breckenridge, (A4)	2,401
Brewster, (B7)	405
Bricelyn, (D7)	564
Bricton, (D5)	160
Bronson, (A2)	181
Brooklyn Center (D5)	788
Brookpark, (E5)	167
Brooks, (B3)	350
Brookston, (E4)	135
Brooten, (B5)	649
Browerville, (C4)	681
Brownsdale, (E7)	271
Brownsville, (F7)	338
Brownton, (C6)	540
Brown Valley, (A5)	1,073
Bruno, (E4)	217
Buckman, (D5)	227
Buffalo, (C5)	1,438
Buffalo Lake, (C6)	468
Buhl, (E3)	2,007
Burtrum, (C5)	212
Butterfield, (C7)	404
Byron, (E6)	302
Caledonia, (F7)	1,570
Callaway, (B4)	325
Calumet, (D3)	445
Cambridge, (D5)	1,080
Campbell, (A4)	424
Canby, (A6)	1,754
Cannon Falls, (E6)	1,315
Canton, (F7)	365
Carlos, (B5)	208
Carlton, (E4)	700
Carver, (D6)	504
Cass Lake, (C3)	2,109
Center City, (E5)	285
Centerville, (D5)	209
Ceylon, (C7)	543
Champlin, (D5)	270
Chandler, (B7)	272
Chanhassen, (D6)	129
Chaska, (D6)	1,966
Chatfield, (E7)	1,382
Chisago City, (E5)	422
Chisholm, (E3)	9,039
Chokio, (A5)	420
Clara City, (B6)	750
Claremont, (E6)	334
Clarissa, (C4)	421
Clarkfield, (B6)	724
Clarks Grove, (D7)	175
Clearbrook, (B3)	310
Clear Lake, (D5)	275
Clearwater, (C5)	331
Clements, (C6)	196
Cleveland, (D6)	269
Climax, (A3)	274
Clinton, (A5)	512
Clitherall, (B4)	178
Clontarf, (B5)	223
Cloquet, (E4)	5,127
Cobden, (C6)	108
Cohasset, (D3)	420
Cokato, (C5)	1,014
Cold Spring, (C5)	705
Coleraine, (D3)	1,300
Collegeville (C5)	100
Cologne, (D6)	383
Columbia Heights, (D5)	2,968
Comfrey, (B6)	533
Comstock, (A4)	200
Conger, (D7)	200
Cook, (E3)	250
Correll, (A5)	176
Cottage Grove, (E6)	130
Cotton, (E3)	170
Cottonwood, (B6)	813
Courtland, (C6)	224
Cramer, (C6)	382
Cromwell, (E4)	164
Crookston, (A3)	6,825
Crosby, (C4)	3,500
Crystal, (D5)	814
Crystal Bay, (D6)	160
Culver, (E4)	220
Currie, (B6)	405
Cuyuna, (D4)	417
Cyrus, (B5)	312
Dakota, (F7)	150
Dalton, (B4)	200
Danube, (B6)	300
Danvers, (B5)	253
Darfur, (C6)	112
Darwin, (C5)	132
Dassel, (C5)	804
Dawson, (A6)	1,511
Dayton, (D5)	299
Deep Haven, (D6)	238
Deercreek, (B4)	381
Deer River, (D3)	1,044
Deer Wood, (D4)	532
Degraff, (B5)	246
Delano, (D5)	924
Delavan, (C7)	318
Delft, (B7)	110
Delhi, (B6)	194
Dellwood, (E5)	87
Dennison, (E6)	218
Dent, (B4)	221
Detroit, (B4)	3,426
Dexter, (E7)	298
Dilworth, (A4)	882
Dodge Center, (E6)	921
Donaldson, (A2)	167
Donnelly, (A5)	354
Doran, (A4)	98
Dorset, (C4)	100
Douglas, (E6)	150
Dover, (E7)	266
Dovray, (B4)	150
Dresbach, (F7)	176
Drummond, (F3)	100
Duluth, (F4)	98,917
Dumont, (A5)	210
Dundas, (D6)	373
Dundee, (B7)	215
Dunnell, (C7)	247
Eagle Bend, (C4)	600
Eagle Lake, (D6)	231
East Grand Forks, (A3)	2,490
Easton, (D7)	326
Echo, (B6)	482
Eden Valley, (C5)	665
Edgerton, (A7)	657
Edina, (D6)	1,833
Eitzen, (F7)	250
Elba, (E6)	172
Elbow Lake, (A5)	867
Eldred, (A3)	175
Elgin, (E6)	501
Elizabeth, (A4)	204
Elk River, (D5)	983
Elkton, (E7)	102
Ellendale, (D7)	367
Ellsworth, (B7)	667
Elmore, (C7)	904
Ely, (F3)	4,902
Elysian, (D6)	354
Emmons, (D7)	297
Erhard, (A4)	100
Erskine, (B3)	457
Euclid, (A3)	250
Eureka, (D6)	100
Evan, (C6)	123
Evansville, (B4)	427
Eveleth, (E3)	7,205
Excelsior, (D6)	799
Eyota, (E6)	403
Fairfax, (C6)	1,066
Fair Haven, (C5)	160
Fairmont, (C7)	4,630
Faribault, (D6)	11,089
Farley, (C3)	43
Farmington, (D6)	1,449
Farris, (C3)	84
Farwell, (B5)	140
Federal Dam, (C3)	332
Felton, (A3)	184
Fergus Falls, (B4)	7,581
Fertile, (A3)	800
Finlayson, (D4)	293
Fisher, (A3)	305
Flensburg, (C5)	210
Flom, (A3)	150
Floodwood, (D4)	277
Florence, (A6)	120
Foley, (D5)	837
Fond du Lac, (E4)	350
Forada, (B5)	92
Forest Lake, (E5)	800
Foreston, (D5)	328
Fort Snelling, (D6)	800
Fosston, (B3)	1,014
Fountain, (E7)	346
Foxhome, (A4)	256
Fox Lake, (D3)	110
Franklin, (C6)	510
Franklin (St. Louis Co.) (E3)	807
Frazee, (B4)	1,277
Freeborn, (D7)	250
Freeport, (C5)	525
Fridley, (D5)	200
Frontenac, (E6)	280
Frost, (D7)	252
Fulda, (B7)	893
Funkley, (C3)	56
Garden City, (C6)	290
Garfield, (B5)	176
Garvin, (B6)	350
Gary, (A3)	333
Gaylord, (C6)	783
Gemmell, (C2)	120
Geneva, (D7)	207
Genola, (C5)	156
Gentilly, (A3)	100
Georgetown, (A3)	136
Ghent, (B6)	316
Gibbon, (C6)	583
Gilbert, (E4)	3,510
Gilman, (C5)	120
Gladstone, (D6)	450
Glencoe, (C6)	1,747
Glenville, (D7)	379
Glenwood, (B5)	2,187
Glyndon, (A4)	382
Golden Valley, (D5)	830
Gonvick, (B3)	276
Goodhue, (E6)	398
Goodridge, (B2)	231
Good Thunder, (D6)	464
Gordonsville, (D7)	200
Graceville, (A5)	1,022
Granada, (C7)	387
Grand Marais, (F2)	443
Grand Meadow, (E7)	579
Grand Portage, (G2)	200
Grand Rapids, (D3)	2,914
Grandy, (D5)	150
Granger, (E7)	120
Granite Falls, (B6)	1,611
Grasston, (D5)	239
Greenbush, (A2)	310
Green Isle, (C6)	252
Green Valley, (B6)	100
Greenwald, (C5)	153
Grey Eagle, (C5)	399
Groningen, (E4)	150
Grove City, (C5)	388
Grygla, (B2)	155
Guckeen, (C7)	150
Gully, (B3)	250
Hackensack, (C4)	200
Hadley, (B7)	147
Hallock, (A2)	1,012
Halstad, (A3)	528
Hamburg, (D6)	153
Hamel, (D5)	130
Hammond, (E6)	226
Hampton, (E6)	246
Hancock, (B5)	763
Hanley Falls, (B6)	326
Hanover, (D5)	199
Hanska, (C6)	412
Hardwick, (A7)	217
Harmony, (E7)	718
Harris, (E5)	672
Hartland, (D7)	229
Hastings, (E6)	4,571
Hatfield, (A7)	99
Hawick, (C5)	150
Hawley, (A4)	939
Hayfield, (E7)	799
Hayward, (D7)	200
Hazelrun, (B6)	145
Hector, (C6)	830
Heidelberg, (D6)	73
Henderson, (C6)	766
Hendricks, (A6)	731
Hendrum, (A3)	354
Henning, (B4)	755
Henriette, (D5)	275
Herman, (A5)	630
Heron Lake, (B7)	922
Hewitt, (C4)	399
Hibbing, (D3)	15,089
High Forest, (E7)	127
Hill City, (D4)	928
Hillman, (D4)	35
Hills, (A7)	418
Hinckley, (E4)	673
Hines, (C3)	100
Hitterdal, (A4)	204
Hoffman, (B5)	475
Hokah, (F7)	407
Holdingford, (C5)	507
Holland, (A6)	318
Holloway, (B5)	289
Holman, (D3)	88
Holmes City, (B5)	100
Holt, (A2)	232
Homer, (F6)	100
Hopkins, (D6)	2,800
Houston, (F7)	778
Hovland, (G2)	100
Howard Lake, (C5)	744
Hubbard, (B4)	200
Hugo, (D5)	246
Humboldt, (A2)	198
Huntley, (C7)	150
Hutchinson, (C6)	3,379
Ihlen, (A7)	211
International Falls, (D2)	3,448
Invergrove, (D6)	363
Iona, (B7)	365
Iron, (E3)	92
Ironton, (C4)	1,165
Isanti, (D5)	411
Island Lake, (C3)	41
Isle, (D4)	328
Ivanhoe, (A6)	655
Jackson, (C7)	2,144
Janesville, (D6)	1,251
Jasper, (A7)	968
Jeffers, (B6)	393
Jenkins, (C4)	125
Johnson, (A5)	100
Jordan ,(D6)	1,106
Kandiyohi, (C5)	184
Karlstad, (A2)	286
Kasota, (D6)	686
Kasson, (E6)	1,150
Keewatin, (D3)	1,879
Kelliher, (C3)	514
Kellogg, (E6)	370
Kelsey, (E3)	100
Kennedy, (A2)	311
Kenneth, (A7)	225
Kensington, (B5)	252
Kent, (A4)	150
Kenyon, (D6)	1,362
Kerkhoven, (B5)	568
Kerrick, (E4)	100
Kiester, (D7)	257
Kilkenny, (D6)	218
Kimball, (C5)	445
Kinbrae, (B7)	121
Kingston, (C5)	250
Kinney, (E3)	1,200
Kitzville, (K5)	480
Knife River, (F4)	491
La Crescent, (F7)	367
Lafayette, (C6)	309
Lake Benton, (A6)	944
Lake City, (E6)	2,846


PORTION OF MINNESOTA
(COOK COUNTY)
COOK
LAKE SUPERIOR
Scale same as Large Map
Grand Portage
Hovland
Grand Marais
Cascade
Meredith
Lutsen
Schroeder
MANITOBA
DOMINION
CANADA
ONTARIO
NORTH DAKOTA
Lake of the Woods
Rainy Lake
Upper Red Lake
Lower Red Lake
RED LAKE IND. RES.
KITTSON
ROSEAU
MARSHALL
PENNINGTON
RED LAKE
POLK
NORMAN
CLAY
BECKER
MAHNOMEN
WHITE EARTH IND. RES.
CLEARWATER
HUBBARD
BELTRAMI
LAKE OF THE WOODS
KOOCHICHING
ITASCA
SAINT LOUIS
LAKE
COOK
AITKIN
CARLTON
CASS
CHIPPEWA IND. RES.
Leech Lake
Bois Fort Ind. Res.
International Falls
Fort Frances
Thief River Falls
Crookston
East Grand Forks
Grand Forks
Fargo
Moorhead
Detroit
Bemidji
Duluth
Superior
Two Harbors
Cloquet
Hibbing
Virginia
Grand Rapids
LAKE SUPERIOR
602 ft. above mean sea level
Apostle Islands
97°
96°
95°
94°
93°
92°
91°
90°
49°
48°
47°
A
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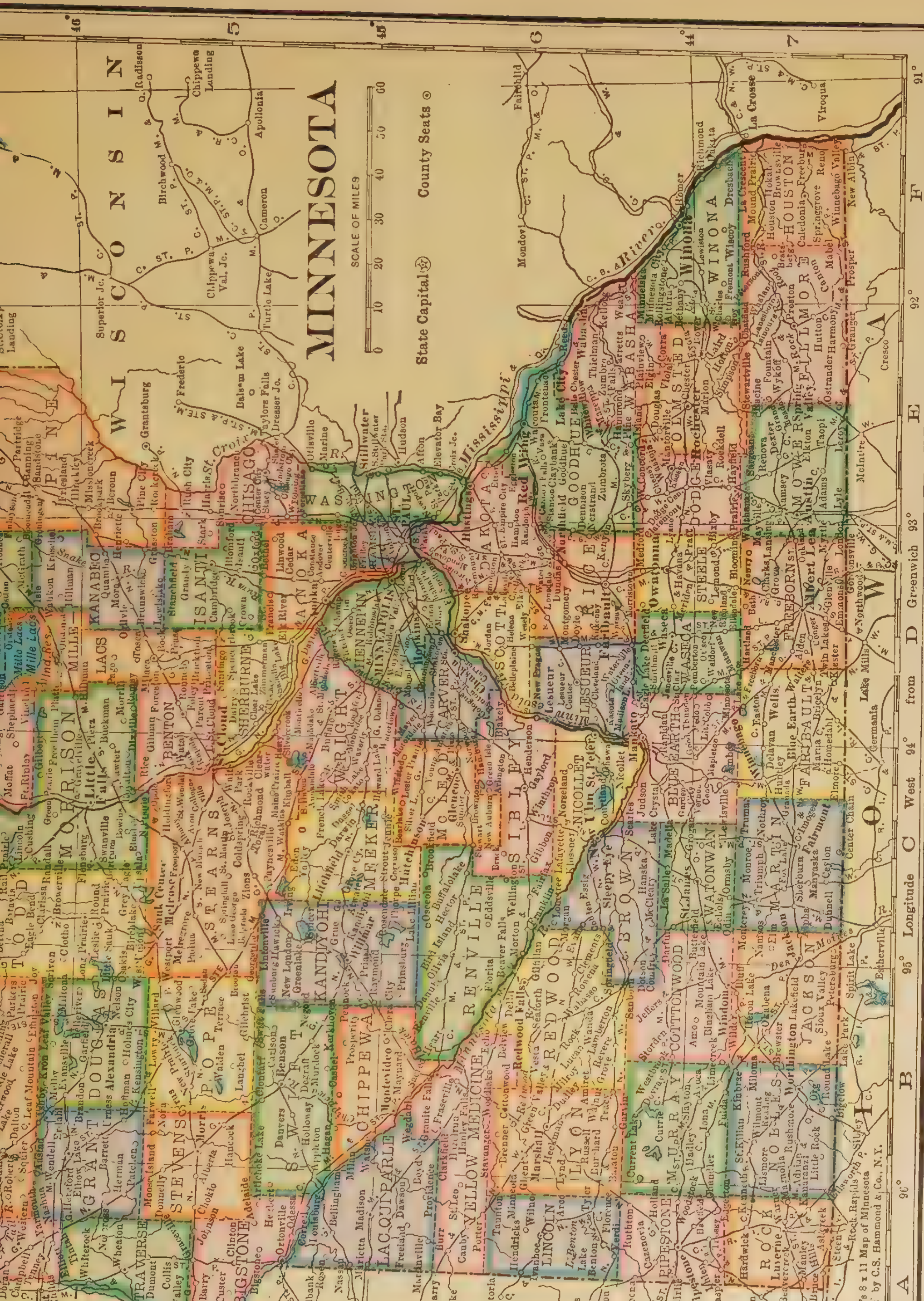

MINNESOTA

SCALE OF MILES

0 10 20 30 40 50 60

State Capital ✪ County Seats ⊙

Hammond's 8 x 11 Map of Minnesota
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MINNESOTA - Cont'd.

Lake Crystal, (C6)	1,204
Lake Elmo, (E6)	200
Lakefield, (B7)	1,346
Lake Fremont, (D5)	240
Lake Henry, (C5)	197
Lakeland, (E6)	200
Lake Park, (A4)	700
Lakeville, (D6)	474
Lake Wilson, (B7)	354
Lamberton, (B6)	872
Lancaster, (A2)	354
Lanesboro, (E7)	1,015
Lansing, (D7)	200
Laporte, (C3)	216
Laprairie, (D3)	63
La Salle, (G6)	150
Lastrup, (C4)	121
Lengby, (B3)	170
Leonard, (B3)	110
Leonidas, (E3)	457
Leroy, (E7)	707
Lester Prairie, (C6)	434
Lesueur, (D6)	1,795
Lesueur Center, (D6)	863
Lewiston, (F7)	758
Lewisville, (C7)	229
Lindstrom, (E5)	523
Lismore, (B7)	350
Litchfield, (C5)	2,790
Little Falls, (C5)	5,500
Little Fork, (D2)	397
Little Swan, (E3)	200
London, (D7)	175
Long Lake, (D6)	148
Long Prairie, (C5)	1,346
Longville, (C3)	100
Lonsdale, (D6)	459
Loretto, (D6)	150
Louisburg, (A5)	99
Lowry, (B5)	225
Lucan, (B6)	181
Luce, (B4)	135
Luverne, (A7)	2,782
Lyle, (E7)	505
Lynd, (B6)	200
McGregor, (D4)	195
McIntosh, (B3)	805
McKinley, (E3)	395
Mabel, (F7)	550
Madelia, (C6)	1,447
Madison, (A5)	1,838
Madison Lake, (D6)	359
Magnolia, (B7)	219
Mahnomen, (B3)	1,076
Mahtomedi, (E5)	200
Mahtowa, (E4)	300
Mallard, (B3)	37
Manchester, (D7)	125
Manganese, (C4)	183
Mankato, (D6)	12,469
Mantorville, (E6)	381
Maplebay, (A3)	110
Maplelake, (D5)	677
Maple Plain, (D5)	273
Mapleton, (C7)	857
Marble, (D3)	742
Marietta, (A5)	413
Marine on Saint Croix, (E5)	361
Marshall, (B6)	3,092
Matawan, (D7)	100
Mayer, (D6)	114
Maynard, (B6)	536
Mazeppa, (E6)	481
Medford, (D6)	250
Meiregrove, (C5)	185
Melby, (B4)	100
Melrose, (C5)	2,529
Menahga, (B4)	478
Mendota, (D6)	193
Mentor, (A3)	255
Meriden, (D6)	209
Mesaba, (E3)	51
Middle River, (A2)	324
Milaca, (D5)	1,317
Milan, (B5)	590
Millerville, (B4)	152
Millville, (E6)	194
Milroy, (B6)	177
Minneapolis, (D6)	380,582
Minneiska, (F6)	208
Minneota, (A6)	894
Minnesota City, (F6)	141
Minnesota Lake, (D7)	450
Minnetonka Beach, (D6)	94
Mizpah, (C3)	212
Monterey, (C7)	317
Montevideo, (B6)	4,419
Montgomery, (D6)	1,297
Monticello, (D5)	1,024
Montrose, (D5)	268
Moorhead, (A4)	5,720
Mooselake, (E4)	571
Mora, (D5)	1,006
Morgan, (C6)	670
Morris, (B5)	2,320
Morristown, (D6)	688
Morton, (C6)	709
Motley, (C4)	396
Motordale, (C6)	230
Mound, (D6)	393
Mountain Iron, (E3)	1,546
Mountain Lake, (B7)	1,309
Munger, (E4)	150
Murdock, (B5)	391
Myrtle, (D7)	150
Nary, (C3)	49
Nashua, (A4)	127
Nashwauk, (D3)	2,414
Nassau, (A5)	168
Nelson, (B5)	159
Nerstrand, (E6)	245
Nevis, (C4)	412
New Auburn, (C6)	209
New Brighton, (D5)	368
New Duluth, (E4)	800
Newfolden, (A2)	246
New London, (B5)	527
New Market, (D6)	211
New Munich, (C5)	325
Newport, (E6)	453
New Prague, (D6)	1,540
New Richland, (D7)	754
New Trier, (E6)	122
New Ulm, (C6)	6,745
New York Mills, (B4)	700
Nicollet, (C6)	404
Nielsville, (A3)	250
Norcross, (A5)	195
Northbranch, (E5)	742
Northfield, (D6)	4,023
Northland, (E3)	150
North Mankato, (C6)	1,840
Northome, (C3)	270
North Redwood, (B6)	176
North Saint Paul, (D5)	1,979
Norwood, (C6)	563
Nymore, (C3)	834
Oakland, (D7)	110
Odessa, (A5)	271
Odin, (C7)	195
Ogema, (A3)	238
Ogilvie, (D5)	436
Okabena, (B7)	225
Oklee, (B3)	364
Olivia, (B6)	1,188
Onamia, (D4)	416
Orleans, (A2)	100
Ormsby, (C7)	115
Oronoco, (E6)	220
Ortonville, (A5)	1,758
Osakis, (B5)	1,480
Oslo, (A2)	365
Osseo, (D5)	433
Ostrander, (E7)	206
Ottawa, (D6)	210
Ottertail, (B4)	223
Owatonna, (D6)	7,252
Parkers Prairie, (B4)	570
Park Rapids, (C1)	1,603
Paynesville, (C5)	1,060
Pelan, (A2)	150
Pelican Rapids, (A4)	1,156
Pemberton, (D7)	250
Pennock, (B5)	251
Pequot, (C4)	419
Perham, (B4)	1,370
Perley, (A3)	222
Peterson, (F7)	291
Petrell, (E3)	100
Philbrook, (C4)	100
Pierz, (C5)	624
Pillager, (C4)	354
Pine City, (E5)	1,303
Pine Island, (E6)	934
Pine River, (C4)	412
Pipestone, (A7)	3,325
Plainview, (E6)	1,370
Plato, (C6)	251
Plummer, (B3)	252
Porter, (A6)	257
Preston, (E7)	1,227
Princeton, (D5)	1,685
Prior Lake, (D6)	246
Proctor, (E4)	2,378
Prosper, (F7)	100
Racine, (E7)	230
Randall, (C4)	301
Randolph, (E6)	170
Ranier, (D2)	157
Ray, (D2)	400
Raymond, (B5)	416
Reading, (B7)	250
Reads, (E6)	150
Redby, (C3)	93
Red Lake, (C3)	125
Red Lake Falls, (A3)	1,549
Red Wing, (E6)	8,637
Redwood Falls, (B6)	2,421
Remer, (D3)	290
Reno, (F7)	100
Renville, (B6)	1,142
Revere, (B6)	134
Rice, (C5)	315
Richfield, (D6)	2,411
Richmond, (C5)	651
Rich Valley, (D6)	100
Richville, (B4)	281
Riverton, (D4)	398
Robbinsdale, (D5)	1,369
Rochester, (E6)	13,722
Rockcreek, (E5)	150
Rockford, (D5)	324
Rockville, (C5)	172
Rogers, (D5)	190
Rollingstone, (F6)	272
Ronneby, (D5)	76
Roosevelt, (B2)	276
Roscoe, (C5)	182
Roseau, (B2)	1,012
Rose Creek, (E7)	208
Rosemount, (D6)	310
Rothsay, (A4)	398
Round Lake, (B7)	345
Royalton, (C5)	690
Rush City, (E5)	971
Rushford (city), (F7)	1,142
Rushford (village), (F7)	663
Rushmore, (B7)	313
Russell, (B6)	375
Ruthton, (A6)	403
Rutledge, (E4)	90
Sabin, (A4)	300
Sacred Heart, (B6)	763
Saint Anna, (C5)	184
Saint Anthony, (C5)	161
Saint Bonifacius, (D6)	332
Saint Charles, (E7)	1,351
Saint Clair, (D6)	250
Saint Cloud, (C5)	15,873
Saint Francis, (D5)	370
Saint Hilaire, (A2)	346
Saint James, (C6)	2,673
Saint Joseph, (C5)	717
Saint Leo, (A6)	130
Saint Louis Park, (D6)	2,281
Saint Martin, (C5)	177
Saint Michæl, (D5)	406
Saint Michæl Station, (D5)	268
Saint Nicholas, (C5)	173
SAINT PAUL, (E6)	234, 698
Saint Paul Park, (E6)	900
Saint Peter, (C6)	4,335
Saint Stephens, (C5)	246
Saint Vincent, (A2)	343
Salol, (B2)	100
Sanborn, (B6)	487
Sandstone, (E4)	1,200
Sargeant, (E7)	79
Sartell, (C5)	510
Sauk Center, (C5)	2,699
Sauk Rapids, (C5)	2,349
Savage, (D6)	206
Scanlon, (E4)	383
Seaforth, (B6)	113
Sebeka, (B4)	585
Sedan, (B5)	147
Shafer, (E5)	150
Shakopee, (D6)	1,988
Shelly, (A3)	289
Sherburn, (C7)	832
Shevlin, (B3)	184
Silver Lake, (C6)	475
Simpson, (E7)	110
Slayton, (B7)	1,045
Sleepy Eye, (C6)	2,449
Sobieska, (C5)	203
Solway, (B3)	106
South Haven, (C5)	346
South International, (D2)	283
South Park, (D6)	250
South Saint Paul, (D6)	6,860
South Stillwater, (E5)	1,936
Spicer, (C5)	299
Spooner, (C2)	571
Springfield, (B6)	1,849
Springgrove, (F7)	753
Springhill, (C5)	112
Spring Lake, (D5)	200
Springpark, (D6)	100
Spring Vale, (D5)	100
Spring Valley, (E7)	1,871
Stacy, (E5)	150
Stanchfield, (D5)	150
Staples, (C4)	2,570
Starbuck, (B5)	824
Steen, (A7)	250
Stephen, (A2)	581
Stevenson, (D3)	200
Stewart, (C6)	540
Stewartville, (E7)	941
Stillwater, (E5)	7,735
Stockton, (F6)	100
Storden, (B6)	325
Stranguist, (A2)	105
Sturgeon Lake, (E4)	208
Sunburg, (B5)	125
Sunrise, (E5)	130
Swanville, (C5)	400
Swatara, (D4)	110
Taconite, (D3)	621
Taopi, (E7)	153
Taunton, (A6)	183
Taylor's Falls, (E5)	570
Tenney, (A4)	102
Tenstrike, (C3)	235
Terrebonne, (A3)	200
Theilman, (E6)	250
Thief River Falls, (A2)	4,685
Thomson, (E4)	103
Tintah, (A5)	249
Tonka Bay, (E6)	84
Tower, (E3)	706
Tracy, (B6)	2,463
Triumph, (C7)	313
Trommald, (D4)	301
Trosky, (A7)	177
Truman, (C7)	752
Turtle River, (C3)	74
Twin Lakes, (D7)	100
Twin Valley, (A3)	676
Two Harbors, (F3)	4,546
Tyler, (A6)	858
Ulen, (A3)	590
Underwood, (B4)	258
Upsala, (C5)	316
Utica, (F7)	189
Valley Creek, (E6)	130
Vasa, (E6)	200
Verdi, (A4)	150
Vergas, (B4)	361
Vermillion, (D6)	99
Verndale, (B4)	571
Vernon Center, (C7)	233
Veseli, (D6)	179
Vesta, (B6)	334
Victoria, (D6)	205
Viking, (A2)	200
Villard, (B5)	308
Vining, (B4)	241
Viola, (E6)	140
Virginia, (E3)	14,022
Wabasha, (E6)	2,249
Wabasso, (B6)	459
Waconia, (D6)	901
Wadena, (B4)	2,136
Wahkon, (D4)	292
Waite Park, (C5)	963
Waldorf, (D7)	225
Walker, (C3)	735
Walnut Grove, (B6)	653
Walters, (D7)	116
Waltham, (E7)	130
Wanamingo, (E6)	350
Wanda, (B6)	135
Warba, (D3)	300
Warren, (A2)	1,772
Warroad, (B2)	1,211
Warsaw, (D6)	150
Waseca, (D6)	3,908
Watertown, (D6)	534
Waterville, (D6)	1,211
Watkins, (C5)	454
Watson, (B5)	215
Waubun, (B3)	346
Waverly, (C5)	418
Wayzata, (D6)	633
Weaver, (F6)	140
Webster, (D6)	200
Wegdahl, (B6)	175
Welcome, (C7)	612
Wells, (D7)	1,894
Wendell, (B4)	270
Westbrook, (B6)	654
West Concord, (E6)	704
West Minneapolis, (D6)	3,055
Westport, (B5)	175
West Saint Paul, (D6)	2,962
West Union, (B5)	169
Whalan, (E7)	142
Wheaton, (A5)	1,337
White Bear Lake, (D5)	2,022
White Earth, (B3)	350
Wilder, (B7)	91
Willmar, (C5)	5,892
Willow River, (E4)	247
Wilmont, (B7)	376
Wilton, (C3)	176
Windom, (B7)	2,123
Winger, (B3)	325
Winnebago, (C7)	1,641
Winona, (F6)	19,143
Winsted, (C6)	434
Winthrop, (C6)	1,147
Winton, (F3)	499
Withrow, (A4)	110
Wolverton, (A4)	170
Woodlake, (B6)	447
Woodstock, (A7)	277
Worthington, (B7)	3,481
Wrenshall, (E4)	200
Wykoff, (E7)	482
Wylie, (A3)	100
Wyoming, (E5)	253
Young America, (D6)	335
Zemple, (D3)	284
Zimmerman, (D5)	250
Zumbro Falls, (E6)	193
Zumbrota, (E6)	1,265

in the lower Red River Valley, 28 at the Twin Cities, Rainy Lake or Lake Superior, and 34 in southeastern Minnesota. The elevation of the State, its fine drainage system and the dryness of its atmosphere, especially in the winter, contribute to make it one of the most healthful regions in the world. At the Twin Cities the death rate is only 10 per thousand annually.

Soil.— The prevailing soil is a black loam underlaid by clay. This soil is deep and rich in the southern part of the State and in the Red River Valley. It is somewhat more shallow and sandier in the belt that skirts the pine woods, and quite sandy in the northeastern part. In the northern part are swampy tracts which, as they are being drained, add largely to the fertile acreage. The heavy soil produces all the varieties of grains and grasses, the sandy soil, clovers and potatoes, vegetables and fruit. With the exception of some rocky land in the northern part, a great deal of which is being reserved for a permanent white pine forest, there is scarcely any land in the State that is not productive or that does not promise to be productive as soon as it can be reached with the necessary improvements, either ditching or clearing.

Geology.— The surface of Minnesota, excepting the southeastern corner, is of glacial drift. Under this drift are found rocks of all ages. On the international boundary extending east to Lake Superior from Lake of the Woods and thence southwestward to the Minnesota River between Big Stone and New Ulm but terminating southwest of the river occur the gneisses, schists and granites of the Archaian, or earliest, geologic age. Granite Falls in the upper Minnesota is formed by a granite outcrop. Of the second geologic period, the Paleozoic, the earliest, or Cambrian, limestones and sandstones occur from Taylor's Falls on the Saint Croix and Kettle rivers southwest to the Minnesota and Blue Earth rivers, and along the Saint Croix and Mississippi to the southeastern part of the State. Lower Cambrian, or red sandstone conglomerate and trappean rocks, are found on the border of Lake Superior and in Pine, Chisago and Kanebec counties in the eastern part of the State. In southwestern Minnesota this formation is found as red quartzite, or the pipestone and jasper of which the Indians were very fond. Rocks of the second system of the Paleozoic Age, Silurian limestones and shales are found from Minneapolis south to northeastern Iowa, and those of the Devonian, or third system. extend through Fillmore and Mower counties into Iowa. Of the Mezozoic, or third geologic age, including Carboniferous, or coal-bearing limestones, Minnesota has none; but of the Cenozoic, or fourth great system, rocks are found over the western two-thirds of the State. These belong to the Cretaceous, or earliest period of this age and are the basis of the Coteau des Prairies in the southwestern part.

The glacial sheet, which covered almost the entire State, receding, left its drift to an average depth of 100 feet. Twelve marginal moraines marking the successive outlines of the front of the ice sheet have been mapped. These cross Minnesota. Their ridges and knolls contain large boulders. In the Red River Valley, sloping southward in the direction of the ice recession, a great ice-dammed lake — called Lake Agassiz by the geologists — was formed and held by the waning ice sheet. This lake attained a length of 700 miles and extended into Montana with a width of over 200 miles. It thus had an area of about 110,000 square miles. Many ridges of sand and gravel reveal the beach lines of the lake, which, as it was lowered, ceased to drain southward through the Minnesota and Mississippi rivers and was finally reduced in size to Lake Winnepeg, leaving behind the present Red River Valley, the most fertile wheat land in the world.

Minerals.— Minnesota produces more iron ore than any other district in the world. In 1884 the first mines were opened in the Vermillion Range and for the first 20 years produced 1,000,000 tons annually. In 1892 the Mesabe Range was opened and in 10 years averaged 5,000,000 tons a year. During the next 15 years these ranges averaged nearly 25,000,000 tons a year. In 1910 the Cuyuna Range, extending southwestward from the Mesabe for 50 miles, was opened. It has yielded an annual output of approximately 1,000,000 tons. From the beginning of mining in the State a grand total of 500,000,000 tons have been shipped. In 1922 the production was 30,209,372 tons. The school of mines of the University of Minnesota estimates that there are 1,500,000,000 tons of merchantable ore remaining on the different ranges. This estimate does not provide for possible discoveries still to be made by which a great deal of ore may become merchantable. A great deal of the mining is of the open-pit character. Steam shovels load the ore on trains that are run directly to the docks at Two Harbors or Duluth where steamers wait to carry it to the steel centres at Chicago, Gary or Erie. See article on DULUTH.

Minnesota also quarries its valuable building stone. Mankato and Saint Peter limestone and Kettle River sandstone are prized. In 1919 stone worth $1,446,571 was produced. Clay, sand and gravel for tile and brick making and for concrete work and road building are found in large quantities.

Flora and Fauna.— In Minnesota are found most of the plants and animals of the north temperate zone. Along the streams of the southern part thickets of oak, elm, ash, maple, poplar, basswood, plum and cherry trees in great variety are found festooned with grape-vines and sheltering the small fruits and other shrubs, especially the hazel-bush. Scattered over the prairies are strawberries and the northern woods produce blueberries for many markets. These woods, after more than 50 years of arduous lumbering, contain more white pine than is found elsewhere in the Union, besides other varieties of pine, balsam and spruce and hemlock. The State flower is the dainty lady-slipper found along the marshes that also shelter the fringed gentian, and glow with marigolds and golden-rod in 36 varieties. The snow no sooner leaves the prairies than the pasque-flower appears and the anemone shows through the leaves soon after. Violets, columbines, bloodroots, geraniums, buffalo-beans, roses, tiger and pond lilies and sun-flowers follow through the summer until the aster succumbs to the September frost. Clovers, especially persistent, have invited extensive dairying and many varieties of grasses have been introduced to supplement them. In fact the climate and soil of Minnesota have made possible the introduction of many plants once looked upon as exotic but now showing everywhere on the lawns and farms of the State without being protected against the winter.

The French explorers found the beaver working along every stream, and they, with succeeding trappers, almost exterminated this animal; but of late years under the protection of the State the beaver is multiplying rapidly. Marten, otter, mink, muskrat and other fur-bearers have always been numerous. In the wilder parts of the State coyotes and timber wolves, black bears, foxes, lynx and various rodents, including the gopher, for which Minnesota has been called «The Gopher State,» are prevalent, except where care has been taken to prevent their becoming a nuisance to stock or to crops. Deer and moose attract hunters to the northern part of the State. The streams and lakes are well stocked with pickerel, pike, bass, crappies and sunfish and some trout are caught.

Forestry.— The pine of Minnesota seemed inexhaustible to the pioneers. It stretched from the Rum River, 20 miles north of Minneapolis, to the international boundary and covered two-thirds of the State in width. Mills at Minneapolis, in one year cutting 500,000,000 feet of lumber, made that city the first lumber centre of the world. Gradually the lumbering operations have moved northward, following the diminishing timber, until they are confined to a comparatively small area. Within this area, however, mills, notably at Virginia, are promised logs for 20 years; that is regardless of fresh supplies guaranteed by scientific forestry. In 1919 the total lumber cut in the State was 699,639,000 feet. Beside this, 115,741,000 laths, 4,451,000 shingles, and some thousand feet of ties, posts, poles and mining timber, and box-lumber were cut. Balsam, hemlock, spruce and even the once despised jack-pine are used for the coarse grades of lumber as well as for these other purposes. Of white pine 20,000,000,000 feet remain, of other woods, 70,000,000,000.

Minnesota, through its forestry commission which employs the State forester and his rangers, is taking steps to protect the timber that remains and to replant large areas unfit for agriculture that will grow merchantable white pine in 40 years. It has passed laws to control the operations of lumbermen, so as to prevent fires from accumulations of waste, to safeguard timber from locomotive and camp fires, to assist lumbermen through laboratory experiments and to ensure to the State a permanent supply of lumber. The State owns 400,000 acres in forest reserves; and the United States government 1,000,000. To patrol this territory and to carry on the other work of the forestry commission 50 men are employed. It is estimated that 15,000,000 acres can profitably remain in forest, or about half of the original timber area. With the development of the plans outlined by the commission Minnesota will be able to produce 4,000,000,000 feet of lumber annually.

Agriculture.— Minnesota has been called «the Bread and Butter State,» for its yields of wheat and dairy products have been its chief claim to agricultural distinction; but other crops are gaining in importance. Corn-growing has advanced northward until Aitkin County, 250 miles north of the Iowa line, once supposed to be the limit beyond which corn could not be ripened, enters prize-winning ears at the Minnesota State Fair. The growing of corn in the southern part of the State, and the corresponding increase of stock-raising, has restored the soil to profitable wheat land, although the great wheat fields are in the Red River Valley. Potatoes are the chief crop in the district between the upper Saint Croix and the Mississippi rivers; and are entering into the calculation of farmers in other parts of the State. While Minnesota cannot be called a fruit-growing State in the sense that New York and Michigan are held, its State Horticultural Society and experiment stations have made it clear to the farmers that they can count on good crops of strawberries, raspberries and plums, each of which have been greatly improved in yield, appearance, keeping quality and cold-resisting ability. Apples are produced in all parts of the State, although a good winter apple is still to be found. Vegetables of all kinds are easily produced and grow to a great size, especially in the sandy parts of the State. The dairying industry shows a constant gain over the State year by year. Poultry-raising is also on the increase. A striking movement is that toward the improvement of stock. Bee-keeping has received an impetus through the appointment of State inspectors to ensure the health of the colonies and to suggest the best methods of obtaining results. It is significant that as the cut-over lands are brought under cultivation by the assistance of the United States and Minnesota agricultural stations, the most efficient men are sent out as county agents to prevent the waste and loss that were inevitable in the days of the first prairie farms, so that surprising improvement takes place in the shortest possible time. A comparison between the statistics for 1910 and 1920–23 follows:

	1910	1920	Value
Acres in farms	27,675,823	30,221,758	$125.32‡
Improved land	19,643,533	21,481,710	....
Number of farms	156,137	178,478	....
Acreage per farms	....	169.3	....
Number of cattle.	2,347,435	2,930,000†	$103,423,000†
Horses and mules	760,000	897,000†	69,119,000†
Swine	1,520,257	2,610,000†	34,452,000†
Sheep	637,582	400,000†	2,880,000†
Poultry	11,862,787	13,663,443	11,405,427
Creameries and cheese factories	784	....	....
Pounds of butter and cheese	35,000,000	146,295,141	$81,365,245
Bushels of wheat.	57,057,412	27,036,000*	27,306,000*
Corn	67,897,051	131,307,000*	73,532,000*
Barley	34,927,773	24,062,000*	11,309,000*
Oats	93,897,717	142,746,000*	45,679,000*
Rye	4,426,028	21,926,000*	14,910,000*
Potatoes	26,802,948	43,740,000*	15,309,000*
Tons of hay	6,036,747	3,141,000*	33,609,000*
Flaxseed, bushels.	3,277,238	3,770,000*	8,219,000*

* 1922 † 1923. ‡ Value per acre.

The total value of the 1920 crop, according to the United States government, was $506,020,233. The value of the machinery and implements used on the farms is $181,087,968. In 1922, onions showed the largest returns per acre, yielding 1,058 car loads on 1,511 acres with an average of 350 bushels to the acre.

The State still holds 2,000,000 acres of farm land and the United States 800,000. The proposed special government aid in developing public lands and a law already in force that provides for the clearing of a portion of each 40-acre tract sold by the State, will greatly stimulate agricultural improvement in Minnestota.

Manufactures.— The raw materials close at hand — breadstuffs, livestock, lumber and iron — are the basis of most of the manufacturing done in the State. Flour and grist-mill products are of prime importance. Beginning with the government mill at Saint Anthony Falls in 1821 the industry has thrived enormously. By the substitution of steel rolls for buhr stones, and by the invention of the bolting process that purifies and saves the middlings that once were largely waste, Minnesota millers in the seventies took first place in the world, and in 1919 firms to the number of 248 made flour valued at $381,248,891. (See MINNEAPOLIS — *Manufacturing*). The second industry is the slaughtering of cattle, sheep and hogs. South Saint Paul is the centre of this trade. Extensive yards receive the stock from the ranches and farms of Montana, Wyoming, the Dakotas and Minnesota, and the packing-houses produce an annual value of $146,361,000. The third industry is the manufacture of lumber and other timber products, such as sash and doors, cooperage and boxes. In these interests there are 338 firms, and they produce an annual total of $49,255,000. Foundry products, machinery and car repairs together make an industry of importance. In all 291 concerns produce goods valued at over $66,000,000. The gas tractor is a rapidly increasing figure. Although farm machinery is chiefly made there is apparently growing diversity in this industry. At Duluth, steel mills are turning the ore of the Mesabe and other ranges into ingots for Eastern shipment, and are making some steel, although the Western market for this product is necessarily limited. Other products of Minnesota manufacturers are butter and cheese (see *Agriculture*); other foods, including confectionery, ice cream and bakery products, valued at $32,350,000; clothing, including knit goods and boots and shoes, $25,000,000; printing and publishing, $32,000,000; linseed oil and meal, $33,238,000, and paper and pulp, $20,138,000. There are 6,225 firms in the manufacturing trade. They employ 115,623 persons and produce annually $1,218,130,000 worth of goods. For this manufacturing there is already available 100,000 horse power in the streams that have been exploited, and, by government estimate, another 100,000 awaiting development. Saint Anthony and Saint Croix Falls, Thompson Dam, in the Saint Louis River, and Coon Creek in the Mississippi are the chief points of contact with an electric system that promises to complete many other projects in the near future. Coal enters the State over Lake Superior, and is stored, pending shipment to various manufacturing points, at the Duluth docks. See DULUTH — *Commerce*.

Banks and Banking.— Minnesota has carefully drawn laws governing banking operations. There are no private banks. All State banks are subject to inspection of the bank examiner. In 1922 there were 1,174 of these banks. Their capital was $35,605,000; their deposits, $425,878,000. The list of State banks includes seven savings banks, and two stock savings banks, with deposits at $59,817,000. There are 343 national banks with a total capital of $37,901,000 and deposits of $372,065,000; and 12 trust companies, capitalized at $7,985,000. At Minneapolis is the Federal Reserve bank for the Ninth District; and at Saint Paul is the Federal Farm Loan Bank for the Northwest territory.

Finance.—Under the direction of the Minnesota Tax Commission all assessments in the State are reviewed, first by the local board, then by the county board to adjust differences between districts, and finally by the commission to arbitrate between counties. Personal property of the first class, including iron ore, in stack piles, is assessed at 50 per cent of its value, personal property of the second class, including livestock, manufacturers' materials and automobiles, bears an assessment on 33⅓ per cent of its value; and personal property of the third class, or household goods beyond exemption of $100, is assessed at 25 per cent of its value. All credits and money is assessed at full value. Rural real estate is taxed at 33⅓ per cent and urban real estate at 40 per cent of its value. Railroads and telegraph and telephone lines pay a gross earnings tax of 5 per cent and 3 per cent respectively. On this basis the State assessed in 1922 its personal property, $2,060,926,895; its real estate, $1,759,835,740; and $425,480,086 on its money and credits. The true and full value of its real estate and of its personal property was very much greater than these figures indicate. In 1896 the State treasurer reported receipts from all sources of $5,482,876; in 1922 of $53,439,731. For defraying the general expenses of the State government and activities there was available about four-fifths of this sum; the remainder was credited to various school funds, certificates of indebtedness and the prison revolving fund in various amounts. Of each dollar received by the treasurer for defraying general expenses, 35.47 cents came from general property taxes, 30.80 from railroad taxes, including freight lines and sleeping-car companies, 9.89 from interest on State lands, State loans and trust funds, 6.80 from various State institutions, 6.64 from departments, 3.78 from inheritances, 2.86 from insurance companies, 1.42 from the State prison and 2.34 from miscellaneous sources. The present rate of State taxation is 3.80 for general expenses, and 2.23 for school and university.

A great asset of the State is its land which is held in trust for the school, university and for permanent improvements. The State owns 2,000,000 acres which, by law passed by the first State legislature, may not be sold for less than $5 per acre, and are actually being sold at a minimum price of $10. The accumulation of the funds received for land already sold amounts to $36,288,569, which is invested under the direction of the State board of investment. The income derived from this investment is apportioned among the schools of the State according to their status (see *Education*). The State owns buildings worth $19,000,000.

Transportation.— Owing to the early settlement of the Saint Croix and Mississippi valleys, the Twin Cities became the railroad centre of the State. Later Duluth developed in commercial importance. A glance at the map shows two great wheel-like systems radiating from these centres, and so intersecting as to provide all parts of the State with transportation. Entering the Twin Cities through Wisconsin are the Minneapolis, Saint Paul and Sault Sainte Marie (Soo Line), two lines; the Chicago, Saint Paul, Minneapolis and Omaha and the Chicago, Burlington and Quincy. On the west bank of the Mississippi the Chicago, Milwaukee and Saint Paul, two lines, Chicago, Rock Island and Pacific, Chicago and Great Western, Minneapolis and Saint Louis and the Chicago, Saint Paul, Minneapolis and Omaha. Westward from the Twin Cities run lines of the Chicago, Milwaukee and Saint Paul, the Minneapolis and Saint Louis and Great Northern, and northwestward to the Red River Valley and Manitoba, the Great Northern, Northern Pacific and Minneapolis, Saint Paul and Sault Sainte Marie. These last three systems, each with two lines, connect Duluth with the Twin Cities; and also put it within easy communication with the Dakotas and Canada. Two short lines connect Duluth with the iron ranges, and the Canadian Northern gives it additional advantages for both Western and Eastern trade. The Chicago, Milwaukee and Saint Paul, Great Northern and Northern Pacific are transcontinental lines, and hence put Minnesota within reach of the great Western Territory with its rapidly increasing commerce and industry. Electric and other lines are developing the more closely populated districts. In all there are 42 companies listed in the report of the railroad and warehouse commission with a total mileage of 9,102, a capitalization of 1,509,349,088, gross earnings of $121,821,203 and net earnings of $54,988,303. These companies in 1916 paid dividends from net earnings of $56,997,194, and from surplus of $33,260,818. They paid to the State in gross earnings a total of $5,436,572. Their bonded indebtedness is $2,034,479,307; their total investment $4,159,487,932.

Water transportation is due to become more of a factor in solving the commercial problem of the State now that the government high dam at Minneapolis is completed, making possible navigation on the Mississippi to that point. For satistics on river navigation and lake trade see articles on Saint Paul and Duluth.

Under the direction of the State Highway Commission and with the aid of laws that take the building of roads from limited local jurisdiction the highways of the State are being greatly improved. The stone and gravel that are easily accessible are being used in road construction with the result that districts in the remote parts of the State are now reached by permanent roads. This is especially true of the northern part of the State. The legislature of 1919 adopted an amendment to be voted on in 1920 allowing the State to issue $10,000,000 a year to a total of $75,000,000, allowing counties to issue up to $250,000. This promises to give the State $109,000,000 for roads within a few years.

Education.— With an annual income of over a million and a half dollars from the permanent school fund, Minnesota is able to encourage all of the local school districts to sustain a high educational standard; at the same time care has been taken to conserve the initiative of these districts by withholding State aid from all that do not meet certain requirements. An attendance of 100 days must be credited to each pupil counted in the number attending a school for a year on which the apportionment is based; a sanitary building properly equipped and teachers graduated from a normal course are other requirements for general aid. Special aid is given to schools that sustain normal courses, agricultural instruction, manual training and domestic science departments. One of the most recent and most effective movements in education is the consolidation of rural schools to provide for grading and more efficient teaching. In 1916 there were 139 such schools in the State, and the number is rapidly increasing. The schools are classified as either rural, consolidated, semigraded, graded and high. Districts are either common, independent or special, the last being a classification for cities such as Minneapolis. Common school districts are governed by the voters in mass meeting who elect and direct a board of three members how to administer the affairs outside of the detailed management of the school. The independent district is somewhat freer of control by the people, but cannot spend money for sites or buildings except as directed by vote. A consolidated district may be either common or independent.

There has been a great growth during the past few years. In 1912 the number of men teaching in the State was 1,720; a few years later it was 1,952, an increase of 14 per cent despite a loss of 20 per cent in men teaching rural schools due to consolidation. The increase of men in graded and high schools in the four years was 46 per cent. Similarly wages increased from $54 for men and $45 for women in the rural schools, and $109 for men and $57 for women in the graded and high schools, to $113 for men and $64 for women in the rural schools and $145 for men and $78 for women in the graded and high schools. Of the teachers employed in the rural districts 3,777 had had a high school training, 3,076 a high school and normal course, 682 a normal training and 191 college training. In the high and graded schools 2,132 were high school graduates; 172 had had high school normal training, 4,684 normal and 2,414 college training. In four years the number of normal graduates had increased 18 per cent, the number of college graduates 40 per cent. In all there were employed during 1922 19,872 teachers. The total enrolment was 505,681. The schoolhouses numbered 8,834. There were over 7,630 libraries containing 1,824,832 volumes. In 1922 $56,344,211 was expended in the State for education.

Higher education is carried on in the six normal schools and in the University of Minnesota. These normals are located at Winona, Mankato, Saint Cloud, Moorhead and Duluth, the university at Minneapolis. The normals enrolled 2,528 pupils and in 1922 had a teaching staff numbering 208. The university enrolled 8,943, of whom about one-half were in the colleges of liberal arts, engineering and mechanic arts, mining, agriculture, law, medicine, dentistry, pharmacy and education; and in the schools of analytical and applied chemistry, school for nurses and graduate school. In the various agricultural courses and in the extension division the remainder were enrolled. Like the common schools the university has invested funds derived from the sale of lands. On 6 May 1915 the regents adopted a recommendation to establish at Rochester graduate research in co-operation with the Mayo Foundation. This provides a

State Capitol at Saint Paul

fund of $1,500,000, free use of laboratories and clinical facilities and pays all salaries of instructors.

Religion.— From the time that the Episcopalians and Presbyterians organized services for the soldiers at Fort Snelling, that the Congregationalists labored with the Indians at Lake Harriet, the Catholics built their chapel at Mendota and the Methodists preached to the first settlers along the Mississippi, missionary effort and church organization in Minnesota has been a great agent in the development of the commonwealth. The Catholics are the strongest numerically, with 480,535 communicants. Saint Paul is the centre of their work. Here is the beautiful cathedral erected in 1913 at a cost of $3,000,000. Here are also the Hill Seminary, and Saint Thomas College with an enrolment of 800. Saint John's College is at Saint Cloud. It enrolls 365. This Church supports parochial schools, both grade and high, in the Twin Cities; and at other places orphan asylums, relief agencies and hospitals, especially Saint Mary's at Rochester, connected with the Mayo Foundation. In all it controls 66 institutions. The Lutherans, Norwegian, Swedish, Danish and German are the second denomination in point of numbers. Altogether there are 300,000. They also support hospitals and colleges. At Saint Paul are Concordia College (German), Luther (Norwegian) and Luther (German) seminaries; at Minneapolis, Augsburg Seminary and Minnesota College (Swedish); at Saint Peter, Gustavus Adolphus College (Swedish), and at Northfield, Saint Olaf's College (Norwegian). Altogether the Lutheran colleges and seminaries enroll 5,000 students. They control 60 institutions. The Episcopal cathedral is at Faribault, where are also Saint Mary's school for girls and Shattuck Military Academy for boys, and the Seabury Divinity School. The Episcopalians have 22,000 members and support 10 institutions. Enrolled in its higher institutions of learning are 800. The Presbyterians number 32,000. They support Macalester College at Saint Paul, which enrolls 400 students. The Methodists are 59,000 in number. Hamline University at Saint Paul and Parker College at Winnebago City, with a total enrolment of 600, are their colleges. The Congregationalists number 25,000. Carleton College at Northfield and Windom College at Montevideo enroll 600. There are 28,000 Baptists and 35,000 of other faiths in the State.

Charities and Correction.— Under the direction of the State board of control are five asylums and hospitals for the insane, schools for the blind, deaf, feeble-minded, dependent children, delinquent boys and delinquent girls, reformatory, prison, sanitorium for consumptives, hospital for crippled children and hospital for inebriates — in all 16 institutions. To support them the State appropriated $3,864,900 for the year 1917–18. The number of insane is 5,839; of defectives, 3,585; of dependents, 655; of delinquent children, 400; of adult prisoners, 1,300; of patients, 1,200. Probation officers reported 5,863 cases during the year 1914 and 1915 in which children have been helped. Jail inspectors reported that 11,822 cases had been disposed of during 1915; and there were in the various county poorhouses of the State 1,910. The total cost of the various county charities during the year of 1915 was $1,317,477. The income from various poorhouses was $29,290 and the income from the work of the State prison twine and farm machinery factories was $556,591. Besides this there was received $125,000 worth of farm and garden produce used or sold by the various institutions. The twine is sold to Minnesota farmers at a slight reduction in price from outside factory products.

History.— The first white men known to have been in Minnesota were Radisson and Groseillers, two French adventurers and traders who made treaties with the Dakota and Chippewa Indians in 1656 and 1659. It seems that they were on Prairie Island in the Mississippi near Red Wing and in what is now Kanabec County. In 1680 Father Louis Hennepin, dispatched by La Salle to explore the upper Mississippi, was captured by the Dakotas and held as a prisoner at their village at Mille Lacs until released by Daniel Greysolon Du Lhut, who had made his way to Fon du Lac in the year previous and had heard of the capture of the other Frenchman. Hennepin descended the great river in August 1680 and named the falls after his patron saint, Saint Anthony. Nine years later Nicholas Perrot, another trader, established himself on Lake Pepin, and in 1700 Pierre Le Seuer ascended the Minnesota and established Fort L'huillier, near the present city of Mankato. He returned to France with some of the peculiarly colored earth of the vicinity which he falsely presumed to be copper ore. In 1732 Captain Verendrye traveled along the northern border of the State, going as far west as the Missouri River. None of the French settlements, however, were permanent.

The English, on the other hand, were interested in the extension of empire rather than merely trading adventures. Jonathan Carver, a native of Connecticut, in 1766 made a considerable inquiry into the extent and the resources of Minnesota, and sought earnestly to form friendships with the natives. He traveled on the Mississippi as far as the Saint Francis River, and on the Minnesota nearly to its source. After his return home he went to England, where his journal was published. The English established trading-posts on the principal waterways and developed an important trade in furs. The Hudson Bay, and later, the Northwest Fur, companies were strongly entrenched in the confidence of the Indians. In the War of 1812 Dakotas served against the American troops.

Upon the purchase of Louisiana, which included Minnesota west of the Mississippi, the eastern part belonging first to Michigan, then to Wisconsin, the United States government determined to explore the territory. Accordingly Lieutenant, afterward Captain, Pike was sent up the Mississippi to make such treaties with the Indians as would guarantee a permanent peace between the Dakotas and Chippewas, hereditary enemies, and thus make possible a profitable trade with both nations. Pike procured from the Dakotas a «strip nine miles long from the Minnesota River on both sides of the Mississippi,» and a similar strip on the Saint Croix River, the Indians reserving the right to pass freely through the ceded territory on their hunting expeditions. In 1817 Major Long of the United States Engineers selected a suitable site for a fort, and two years later Colonel Leavenworth led a body of soldiers to construct the work, first called Fort Saint Anthony, then Fort Snelling, after the commandant relieving Leavenworth, at the junction of the Minnesota with the Mississippi. In 1821 the government built a saw mill on the reservation opposite the falls and in 1823 erected a flour mill nearby. In 1837 the lands east of the Mississippi were opened to settlement by treaty with the Indians; but the government would not permit the settlement of the reservation. Franklin Steele, sutler at the fort, however, built a squatter's cabin on the east bank of the river, intending to lay claim to the water rights. In 1848 he and others were allowed to develop their holdings, and consequently the village of Saint Anthony was platted. Steele built a saw mill, and soon the lumber industry, stimulated by the arrival in Minnesota of experts from Maine, was in full process of development. Similar was the development of the Saint Croix Valley, especially in the neighborhood of Stillwater. Meanwhile other explorations had extended the knowledge of the State. In 1832 Henry Schoolcraft had discovered, or rediscovered after William Morrison, the source of the Mississippi in Lake Itasca. In 1823 Beltrami, an Italian count, explored the country between the Red and Mississippi, and Major Long, G. W. Featherstonaugh and Catlin, the artist, had advertised the picturesqueness and the possibilities of southwestern Minnesota by their tours along the Minnesota River.

These explorations and the beginning of lumbering operations drew the attention of the nation to Minnesota, so that immigration increased rapidly. Saint Paul, at first but a collections of cabins about the home of a whisky trader named Parrant, or «Pig's Eye» in mockery of a defect, afterward enlarged by Swiss refugees from Lord Selkirk's colony at Pembina and dignified by Father Gaultier's building of Saint Paul's Chapel in 1841, became the leading town in the territory; and in 1849 was made the capital of the Territory of Minnesota, organized in that year with Alexander Ramsey governor. Saint Paul was not only the practical head of navigation in the Mississippi, but was the natural outfitting point for pioneers to the rich Minnesota Valley which was opened to settlement in 1851 by treaty with the Dakota Indians. For this reason it grew rapidly. Stillwater on the Saint Croix and Saint Anthony also received large numbers of people. The latter overflowed to the west bank of the river, and Minneapolis (Dakota, «Minnehaha» — Laughing Water — and Greek «Polis,» city) was born, and received official recognition as a village in 1855. Townsites were plotted in various inaccessible parts of the State, real estate values became badly inflated, credit was overstrained, until in 1857, in common with other parts of the country, the Territory suffered from financial panic. Nevertheless, 12 May 1858 a bill giving statehood to Minnesota was signed by the President, and Henry Sibley, who as fur factor for the American Fur Company, had been a unique figure in the life of the Territory for a quarter of a century, and who had been its first delegate in Congress, was made the first governor.

Upon the outbreak of the Rebellion, Ramsey, the second governor, had the honor of offering President Lincoln the first troops, and during the war 11 regiments of infantry, two regiments of artillery, two battalions of cavalry and a company of engineers were sent from Minnesota — 27,000 men in all. Part of these troops were also employed to put down an uprising of the Dakotas under Chief Little Crow. These Indians, resentful over the failure of the United States government to keep its engagements with them, and excited by the prospect of seizing their land while the government was engaged in war, made a sudden attack in August 1862 upon the settlers of the upper Minnesota Valley, and not until 800 whites had been killed were the Dakotas subdued. In September, General Sibley succeeded in capturing the leaders, of whom 38 were executed at Mankato. The tribal life of the Dakotas in the State was broken up so that they never threatened the peace of the State again.

At the close of the war Scandinavians came into the State in great numbers, as Germans had done in the early fifties, and began to open up the central and western parts of the State. Railroad building, delayed by the war, progressed rapidly. The introduction of rolls to take the place of buhr stones and the invention of the bolting process to purify middlings made Minneapolis a great flour centre, as the proximity to immense tracts of white pine had made it a great lumber centre. Saint Paul became a railroad centre of importance and the wholesale and jobbing market of the Northwest.

These advantages and the rapid rise of values produced another period of speculation that culminated in the panic of 1893. The hard times that followed were severly felt in the Twin Cities and in Duluth; but, owing to the substantial development of the rural districts, there was little, if any, retardation in the growth of the State. Lands in the Red River Valley and in southwestern Minnesota produced increasingly, and were in demand. By 1898 the cities were recovering from the effects of the panic, and were beginning to grow conservatively and to improve sanely. For this reason as well as because the riches of the State have been gathered and distributed by most efficient methods the history of Minnesota since 1900 has been one of unbroken prosperity.

Government.— The seat of government is at Saint Paul in a capitol building designed by Cass Gilbert and decorated by LaFarge and other artists, and costing $4,000,000. The distinctive features of Minnesota government are the School Land Law (see *Education*), the Railroad and Warehouse Commission, elected by the people, and designed to adjust rates and other details of transportation in the interests of the public; the administration of State institutions under a board of control appointed by the governor; the Non-partisan Election Law, making all candidates for office within the State, except those running for State executive offices, appeal to the electors on their ability to perform the work required by the office, instead of making the work a political issue, and the Primary Election Law, which takes the place of the convention system of naming candidates. The State has adopted effective measures for road-building, preservation of resources, including Game, Fish and Forest, a Workmen's Compensation Act and a Minimum Wage Law that prohibits the employment of women for less than $8.75 per week. The legislature meets for the first 90 days in each odd-numbered year. Terms for the lower house are two years; for the senate, four. A voter must have lived in the State a year, in his precinct 30 days and be a citizen of the United States. The governor, lieutenant-governor, secretary of state, auditor and treasurer are each elected on a partisan ticket for a term of two years. There are 10 Congressional districts.

In politics the State has been regarded as solidly Republican, and in Presidential elections can be counted on for good Republican majorities. There has been, however, a decided tendency toward independence in politics within the last two decades, especially in the choice for governor. Below is the list of governors since the territory was organized in 1849:

TERRITORIAL.

Alexander Ramsey	1849–53
Willis A. Gorman	1853–57
Samuel Medary	1857–58

STATE.

Henry H. Sibley	1858–60	Democrat
Alexander Ramsey	1860–64	Republican
Stephen Miller	1864–66	Republican
William A. Marshall	1866–70	Republican
Horace Austin	1870–74	Republican
Cushman K. Davis	1874–76	Republican
John S. Pillsbury	1876–82	Republican
Lucius Hubbard	*1882–87	Republican
Andrew McGill	1887–89	Republican
William R. Merriam	1889–93	Republican
Knute Nelson	1893–95	Republican
David M. Clough	1895–99	Republican
John Lind	1899–1901	Democrat-Populist
Samuel R. Van Sant	1901–05	Republican
John A. Johnson	1905–09	Democrat
Adolph O. Eberhart	1909–15	Republican
William S. Hammond	1915–17	Democrat
Joseph A. A. Burnquist	1917–21	Republican
J. A. O. Preus	1921–	Republican

* Inauguration changed to odd-numbered years by legislature.

Population.— The population of the State by decades is given herewith: 1850, 6,077; 1860, 172,023; 1870, 439,706; 1880, 780,773; 1890, 1,301,826; 1900, 1,751,394; 1910, 2,075,708; 1920 (U. S. official) 2,387,125. Of this population 8,761 are Indians, mostly Chippewas on White Earth Reservation; 8,809 are negroes; the rest are white. Of the white population 78.9 per cent are native-born, 21.1 per cent are foreign. Of the foreign-born 219,209 are Scandinavians, 74,634 Germans, 33,732 Canadians, 25,175 British, 16,100 Russians, 11,550 Austrians, 29,108 Finns, 7,432 Italians, 10,697 South Slavs, 18,537 Poles and 12,626 North Slavs.

Bibliography.— Bond, ‹Minnesota and Its Resources› (New York 1854); Johnson, C., ‹Highways and Byways of the Mississippi Valley› (New York 1906); Neill, ‹The History of Minnesota› (Saint Paul 1882); Folwell, W. W., ‹Minnesota› (in ‹American Commonwealth Series,› Boston 1907); ‹Minnesota in Three Centuries›; Parsons, ‹The Story of Minnesota› (1916); Pollock, ‹Our Minnesota› (1916); Minnesota Historical Society Collections (Saint Paul, 15 vols.); Minnesota History Bulletin (1916–17–18); Flandrau, ‹History of Minnesota› (Saint Paul 1900); Gilfillan, ‹Early Political History of Minnesota› (ib. 1901); McVey, F. L., ‹The Government of Minnesota› (New York 1905); O'Brien, ‹Minnesota Pioneer Sketches› (Minneapolis 1905); Robinson, E. V., ‹The Cost of Government in Minnesota› (Saint Paul 1913); id., ‹Early Economic Conditions in Minnesota› (ib. 1915); Carney, ‹The Story of Minnesota› (1919); Emery, ‹The Story of Minnesota, 1916› (Saint Paul 1916); Skinner, ‹The Story of Minnesota› (Chicago 1914); Virtue, ‹Government of Minnesota› (New York 1912); United States Geological Survey, Reports of; reports of State departments and of the United States Census Bureau Crop Survey.

E. DUDLEY PARSONS,
Author of ‹The Story of Minnesota.›

MINNESOTA, a river, which rising in the northwestern part of South Dakota flows through Big Stone Lake on the boundary between Minnesota and South Dakota, then continues southeast in Minnesota a distance of about 350 miles, to where it receives the waters of the Blue Earth, when it turns and flows northeast to the Mississippi River. It enters the Mississippi just south of Minneapolis and opposite Saint Paul. The head waters of the Minnesota rising on the eastern slope and those of the Red River of the North rising on the northern slope of the Coteau des Prairiès — the Hill of the Prairies — of Dakota, are but a short distance apart. The Minnesota is navigable to a rapids about 40 miles from its mouth, and for small vessels nearly 300 miles above the rapids. Its whole length is about 475 miles.

MINNESOTA, University of. A coeducational State institution of higher learning on the east bank of the Mississippi River in Minneapolis, Minn., established by an act of the Territorial legislature in 1851 and confirmed by the State constitution adopted in 1857. The present charter was adopted in 1868, and the first collegiate work was begun in the following year under the direction of the first president, William Watts Folwell, LL.D., a graduate of Hobart College, and a faculty of nine members. In September 1884 Cyrus Northrop, LL.D., a graduate of Yale and professor of English at that institution, succeeded to the presidency. In 1911 he was succeeded by George Edgar Vincent, LL.D., a graduate of Yale, and dean of the faculties of arts, literature and sciences of the University of Chicago. Its government is vested since the death in 1901 of the life regent, John S. Pillsbury, in a board of 12 regents, 9 appointed by the governor of the State and holding office for six years, and three ex-officio members, the governor, the State superintendent of public instruction and the president of the university. The university comprises the following colleges, schools and departments: (1) The Graduate School, with advanced courses in all branches. (2) The College of Science, Literature and the Arts, offering four-year courses, largely elective, leading to the degree of bachelor of arts; a four-year course in arts and music leading to the degree of bachelor of arts in music; courses in which the senior work is offered conjointly with the Schools of Law, Medicine, Dentistry and Chemistry, leading to the same degree; also a four-year course in science and medicine leading to the degree of bachelor of science. (3) The College of Engineering and Architecture is offering five-year courses in civil, mechanical and electrical engineering, and architecture, leading to the degrees of civil, mechanical and electrical engineer and architect. The degrees of bachelor of science in engineering and architecture are conferred at the end of the fourth year. (4) The Department of Agriculture embracing (a) the colleges of agriculture (including agricultural and home economics courses), and forestry, offering four-year courses leading to the degrees of bachelor of science. (b) The schools of agriculture, offering three-year courses adapted especially to the need and opportunities of farm boys and girls. (c) Short courses in dairying, farm management and traction engineering. (d) The experiment stations, offering research advantages. (e) Extension work in agriculture. (5) The law school giving a three-year course leading to the degree of bachelor of laws. (6) The medical school with (a) the five-year course, including one year of hospital interneship leading to the degree of doctor of medicine; (b) the School for Nurses, offering a three-year course leading to the degree of graduate in nursing; and (c) the School of Embalming, offering an annual eight-weeks course, leading to the State embalmers' license. (7) The College of Dentistry with a four-year course leading to the degree of doctor of dental surgery. (8) The College of Pharmacy offering a three- and a four-year course leading to the degrees of pharmaceutical chemist and bachelor of science in Pharmacy respectively. (9) The School of Mines, offering three five-year courses leading to the degrees of engineer of mines, engineer of mines in geology and metallurgical engineer. (10) The School of Analytical and Applied Chemistry with two five-year courses, the Applied Course leading to the degree of chemical engineer, the other offered conjointly with the College of Science, Literature and the Arts, leading to the degrees of bachelor of arts and bachelor of science in chemistry; and a four-year course in analytical chemistry leading to the degree of bachelor of science in chemistry. (11) The College of Education for the training of teachers and supervisors, with a two-year course leading to the degree of bachelor of arts in education. (12) The University Extension Service offering educational opportunities to the people of the State through (a) correspondence courses, (b) evening classes, (c) lecture courses, (d) field debates on public questions, (e) reference bureau. The university also has charge of the geological and natural history survey. The degrees conferred for graduate work are the master's degree in arts, science and pharmacy, and the doctor's degree in philosophy and medicine. No honorary degrees are conferred. The departments of law, medicine and education require two years of collegiate preparation. In all other departments students are admitted on examination or on certificate from accredited schools of the State. Tuition ranges from $30 to $175 a year. In 1922–23 the faculty numbered 914 and the attendance was 11,331, of whom over two-fifths were women. This number was of college grade, sub-collegiate and extension. The general library contained 175,000 volumes and there are special libraries in connection with the various departments of instruction. The laboratories are extensive and well equipped. There are dormitories for the School of Agriculture and one dormitory accommodating 90 women on the main campus. The main university grounds comprise about 109 acres and are valued at $2,000,000. The buildings of the entire institution are valued at $5,700,000, and their equipment at about $2,416,654.35. The university farm, located between Saint Paul and Minneapolis and connected with the main campus by private car line, consists of about 420 acres and is valued at $413,000. The buildings and equipment of the department of agriculture are estimated at $2,374,386.35. The university is supported by the income of its permanent endowment, a State tax of three-hundredths of a mill, and special legislative appropriations for maintenance, buildings and equipment. The gross income for 1922–23, exclusive of special appropriations, was $7,088,894. The endowment was about $2,000,000, and the value of all the university property, $22,070,748.

MINNESOTA HISTORICAL SOCIETY. This society was organized in 1849, the same year with the beginning of Minnesota as a Territory. Its objects are to collect and preserve the history of Minnesota and the Northwest. Membership is open to all who are interested in the work of the Society, on their nomination by any of the present members. At present membership includes 22 honorary members, 80 corresponding members, 255 life members and 68 annual members, in total 425. The life and annual members represent, more or less fully, all large districts of Minnesota. The library now comprises 114,425 books and pamphlets, including 10,042 bound volumes of newspapers. The number of individual portraits, historical pictures and framed documents is about 700, besides 40 group pictures, which comprise about 1,500 portraits. The museum has 30 large cases filled with historical and archæological relics, including about 40,000 specimens of aboriginal implements, weapons and ornaments.

MINNEWAUKON, mĭn-nē-wâ'kŏn, N. Dak., village, county-seat of Benson County, on Minnewaukon Lake, on the Great Northern Railroad, about 115 miles northeast of Bismarck. It has lumber-mills, a grain elevator and a large trade in their manufactured products and agricultural supplies. Pop. 500.

MINNEWAUKON, mĭn-nē-wâ'kŏn, or **DEVIL'S LAKE,** North Dakota, one of a group of salt lakes which have no apparent outlet. It is about 45 miles long and from 2 to 13 miles in width; area, 750 square miles. The color of the water is darker than that of the fresh waters south. The water is too brackish to be used by human kind, but not for the wild animals of the surrounding region. Several villages, exploiting lumber and agricultural products, are on its shores.

MINNOW, a small fresh-water fish; originally a small European fish of the carp family (*Leuciscus phoxinus*). In the United States most of the minnows are of the same family (see Cyprindæ), and are widely known as «shiners» on account of the silvery character of the scales. «The spring or breeding dress of the male is often very peculiar, the top of the head and often the fins and portions of the body are covered with small tubercles, outgrowths from the epidermis; the fins and lower parts of the body are often charged with bright pigment, the prevailing color of which is red, although in some genera it is a satin-white, yellowish or even black.» — Jordan. These little fishes live in clear brooks for the most part and go about in companies furnishing food for larger fishes. Many of them afford good sport to young anglers; and all are sweet pan-fish, but very bony. They are of value and largely used as live-bait. Most of the Eastern examples belong to the genus *Notropis*. (See TOP-MINNOWS). Consult Jordan, ‹Vertebrates of the Northern United States› (11th ed., Chicago 1914).

MINO DA FIESOLE, mee-no dah fee-ay-so-lay, Florentine sculptor: b. Poppi in the Casentino in 1431; d. Florence, 11 July 1484. His real name was Mino di Giovanni. He began work as a stonecutter for Desiderio da Settignano, who always remained his master and friend. His home was Florence, but he worked in Rome in 1454, 1463 and 1464. Of Mino's early works the best are in the Duomo of Fiesole — altarpiece and tomb of Bishop Salutati extecuted before 1466. In the Badia of Florence are an altarpiece and the tombs of Bernardo Giugni (1466) and the Margrave Hugo (1481). These are carved in white marble with life-size sleeping effigies and attendant angels all in the beautiful Renaissance style. After finishing the pulpit in the Prato Cathedral, in collaboration with Antonio Rossellino in 1473, a work remarkable for its delicately sculptured bas-relief depicting the life of the Virgin, he went to Rome where he executed the tomb of Pope Paul II (now in the crypt of Saint Peter's); the tomb of Francesco Tornabuoni in Santa Maria sofra Minerva; and a much-admired little tabernacle for the holy oil in Santa Maria in Trastevere. He is also thought to have been the sculptor of several monuments in Santa Maria del Popolo, particularly those of Bishop Gomiel and Archbishop Rocca. The marble reredos here presented by Pope Alexander VI is also said to have been the work of his hands. There are several tabernacles by him in Santa Croce, Florence, and in the Muzio Nazionale are busts of Piero de' Medici (1453); Giuliano de' Medici and Rinaldo della Luna (1461). Other portrait busts and profile bas-reliefs are preserved in the Bargello, Florence. They are full of life and expression. The Museum of Berlin possesses a female bust and a portrait of Niccolo Strozzi. The Louvre contains a San Giovannino. Consult Vasari, ‹Lives of the Painters› (Vol. II); Perkins, C. C., ‹Handbook of Italian Sculpture› (1883); Bode, Wilhelm, ‹Denkmähler der Renaissance Skülptur Toscanus› (1892–1905); Angeli, ‹Mino da Fiesole› (1905); Winckelmann and D'Agincourt, ‹Storia della Scultura› (1813); Semper, ‹Architektea der Renaissance› (1880).

MINOR, mē'nôr, **Jakob,** Austrian scholar: b. Vienna, 15 April 1855; d. 1912. He was educated at Vienna and Berlin, and became professor of German language and literature at Prague (1884) and of Teutonic philology at Vienna (1885). Besides numerous editions of texts, he published ‹Neuhochdeutsche Metrik› (1893), an excellent study in prosody, and a valuable although unfinished work on Schiller (2 vols., 1890).

MINOR, mī'nŏr, **Lucian,** American lawyer and writer: b. Louisa County, Va., in 1802; d. Williamsburg, Va., in 1858. He was graduated at William and Mary College in 1823, and five years later became commonwealth attorney for Louisa County, Va., holding this office until 1852. In 1855 he was made professor of law in William and Mary College, which post he held until his death. He was a strong advocate of temperance and wrote much on the subject. His tract, ‹Reasons for Abolishing the Liquor Traffic,› reached a sale of 30,000 copies. He wrote a portion of John A. G. Davis' ‹Guide to Justices› (1838); added notes to Daniel Call's ‹Virginia Reports› and condensed the four volumes of Hening and Mumford's ‹Reports› into one volume. His interesting notes of ‹Travel in New England› were edited by James Russell Lowell for the *Atlantic Monthly* after his death.

MINOR, Robert Crannell, American artist: b. New York, 1840; d. 1904. He studied at Barbizon and became a pupil of Diaz. He subsequently went to Antwerp and was taught by Van Luppen and Boulanger, making a specialty of landscape. His student travels led him through Germany and Italy, and on returning to New York he was elected to the National Academy of Design and the Society of American Artists. He exhibited in the salons of Antwerp and Paris, in the Royal Academy of London, as well as in New York, Boston and Chicago. Among his best-known works are ‹Dawn›; ‹Sundown›; ‹The Stream›; ‹October Days›; ‹Morning in June›; ‹The Vale of Kennet›; ‹Sunrise on Lake Champlain›; ‹Cradle of the Hudson›; ‹Cloudy Moonlight›; and ‹A Mountain Path.›

MINOR, *in law,* a person under age of legal capacity, either for any or all acts. Sometimes, as in Scotland, the word is distinguished from the term infant by being more intensive, including those under age but above 14 for male and 12 for female. Usually minor is synonymous with infant (q.v.).

MINOR, a musical term applied to intervals and modes (or scales). I. *Interval*: For purposes of art certain relative distances of height and lowness have to be definitely determined and maintained. The sounds so chosen are notes of the system and the distances between them are intervals. Various national scales present great diversity in this respect; for instance, the ancient Gælic and the Chinese scales (the ladder of notes is called a scale), were constructed so as to avoid any intervals as small as a semitone. The intervals of the ancient Greeks were calculated to develop the resources of melody without harmony. On the other hand the intervals of modern scales are calculated for the development of the resources of harmony rather than melody. The modern scale system is a product of artistic invention; and the determination of the intervals took many centuries to establish. By the time of Bach it was clearly settled. The interval between one note and another is named according to the number of degrees between them on the scale, both notes included; but some intervals, — thirds, for example, — have four semitones and some have three semitones. The former is, therefore, called a major interval and the latter a minor interval; or in other words, a major third and a minor third.

II. *Modes*: When the immediate predecessors of Bach and Handel succeeded in establishing a stable key-system, that key-system took two forms, in both of which the three chords of tonic, dominant and subdominant occupied cardinal points. In one form, or mode, the tonic chord was natural, that is to say, major. In the other form the tonic chord was artificial, that is to say, minor. In the minor mode so firm is the position of the tonic and dominant (the dominant chord being always major) that it is no longer necessary to conclude with a major chord as was the custom in the 16th century. The effect of the minor mode is normally plaintive, because it centres round the artificial concord instead of the natural; and though the keynote bears this artificial triad, the ear, nevertheless, has an expectation (which may be intensified into a powerful emotional effect) that the final conclusion of the harmonic scheme may brighten out into the more sonorous harmonic system of major chords. On the modern sense of the identity of the tonic in major and minor rests the whole distinctive character of modern harmony and the whole key-system of classical composers. The minor mode recognizes two forms of scale, the harmonic and melodic. See SCALE.

MINORCA, mĭ-nôr'ka̤ (Sp. MENORCA, mā-nōr'kä), an island in the Mediterranean, belonging to Spain, the second largest of the Balearic group; greatest length, northwest to southeast, 35 miles; average breadth, about 10 miles; area, 260 square miles, and with dependent islands 293 square miles. It is situated northeast of Majorca, from which it is separated by a strait of 27 miles broad. The coast is much indented on all sides except the south, and generally presents a succession of bold headlands, enclosing small creeks and bays, of which several form good harbors. Of these the best and most frequented is Port Mahon, the capital of the island. The coasts are rugged, and the surface broken and mountainous. Mount El Toro in the centre attains a height of 1,207 feet. The soil is not generally fertile; still, in good seasons the quantity of wheat and barley grown is sometimes equal to the consumption. The other principal products are oil, wine, hemp, flax, oranges and lemons. Some good cheese is made, and considerable attention is paid to the rearing of bees. There is an abundance of small game on the island. Iron, copper, lead, marble, porphyry and alabaster abound in several districts. The inhabitants make excellent sailors, but generally are indolent, ignorant and bigoted. At an early period Minorca was under the Carthaginians, who drew from it a number of excellent slingers, who distinguished themselves during Hannibal's wars in Italy. It afterward passed successively into the hands of the Romans, the Vandals and the Moors. The last were expelled in 1285 by the Spaniards. During the greater part of the 18th century it belonged to the British, who finally ceded it to Spain at the Peace of Amiens (1802). Its exchange with Great Britain for Gibraltar has been frequently discussed. Pop. about 41,939 Consult Markham, Sir C. R., 'The Story of Majorca and Minorca' (London 1908).

MINORCA, a breed of large black and white domestic fowls. See POULTRY.

MINORITY. See ELECTIONS; PRIMARY DIRECT; VOTE, VOTERS, VOTING.

MINORITY AND PROPORTIONAL REPRESENTATION. Under prevailing election methods the views of large numbers of voters are not represented by men of their choosing. Minority parties get a voice in legislative assemblies only by the haphazard preponderance of their members in a few localities. In every voting district that group of electors which is in the minority has no direct representation, and sometimes for a generation its members will go to the polls in vain. Though Norway, in its Constitution of 1814, appears to have been the first country to make an attempt to change this, the subject did not attract general attention till toward the middle of the century. In 1844 Thomas Gilpin published in Philadelphia a pamphlet that led a long train of literature, and in 1857 appeared the first of several books by Thomas Hare, in whose idea of «personal representation» J. S. Mill thought he discovered «the greatest improvement of which the system of representative government is capable.» Since then many plans to accomplish the same end have been suggested. All presuppose that more than one place is to be filled at a time, as a board of aldermen to be elected on a general list, or several representatives from one district. The simplest plan is the single-vote system, where each elector has but one vote and the candidates receiving the largest number of votes are declared elected. It has been used in Philadelphia by the Republican party in the election of ward executive committees, and by the Democratic party in choosing inspectors of election. It is the method justified by the theory that no voter is entitled to be represented in any representative body by more than a single representative and would seem admirably adapted to the conduct of the internal affairs of parties. On the other hand, where the supremacy of party views is the issue, it is manifestly objectionable, as without an impracticable degree of party machinery and discipline, the majority party, if it has nominated as many candidates as there are places to be filled, may so scatter its votes that less than half of them will be elected, and in any event cannot allot its votes so as to ensure a result proportionate to its preponderance. Systems based on the «limited vote» theory meet this objection to some extent. Under them each voter may vote only for some fixed number of candidates less than the number to be elected. In operation this secures representation to the minority party second in rank, but with no relation to its numerical importance and smaller minority parties get no representation at all. With the next group of systems, those known as «cumulative,» arithmetical complications grow. The first practical test of the idea came in 1870, when it was adopted as the method of electing English school boards, and in the same year it was put into the constitution of Illinois by the proviso that «each voter may cast as many votes for one candidate as there are representatives to be elected, or may distribute the same or equal parts thereof among the candidates as he shall see fit.» To each legislative district were allotted three members, so that a voter could cast his three votes for one, a vote and a half for each of two or one vote for each of three. The chief objection comes from the chance and temptation for members of the majority to «plump,» that is, cast all three votes for one man; sometimes this permits the minority to elect two men, when the bulk of the majority vote is concentrated on one popular candidate; therefore, it invites to contests between party colleagues instead of political antagonists, breeds jealousies and disrupts organizations. These evils have been more conspicuous in the choice of English school boards, for the more men to be elected the greater the dangers from «plumping.» Apparently the projectors of the minority representation plan in Illinois expected that the two great parties would continue to nominate three candidates in each district, but the politicians soon discerned the folly of nominating candidates for certain defeat, and each party nominated only two candidates for the three positions to be filled; hence all the nominees except one were practically certain of election. Furthermore, in districts strongly Republican, the Republicans would nominate only two candidates and the Democrats one and the reverse would occur in strongly Democratic districts, with the result that the voter had no choice whatever and a party nomination became equivalent to an election. Public opinion in Illinois has long called for the abolition of this system, but owing to the difficulty of securing constitutional amendments the efforts have been unavailing.

Several systems of proportional representation of minorities have been devised, each of which has its variations in different countries or sections. The first, known as the «free list» plan, provides that the lists of candidates shall be made up by the parties before the election and that the seats to be filled shall be divided between the parties in the proportion of the total votes cast by each, the higher men on each list to be declared elected to the number their party proportion warrants. This system has been in use in some of the Swiss cantons and Belgium enacted it into law in 1899. Its weakness is that it makes election wholly a party matter, practically preventing independent candidacies. A «freer list» plan advocated by William H. Gove of Salem, Mass., provides that the lists shall be made up by the candidates, rather than by the parties. In advance of the election the candidates are to designate who shall get the benefit of any ineffective votes cast for them. When the votes are counted, the first step is to divide the total number of ballots by that of the places to be filled; the quotient determines the number of votes a candidate must get in order to be elected,— his «quota.» Votes cast for any one man beyond his «quota» are ineffective and are ignored, so far as he is concerned, but are to help some other candidate, and the same is true of votes for candidates receiving so small a number that they must fail of election. The «freest list» system, the Hare plan, has the list of preferences made up by neither the party nor the candidate, but by the voter, who designates on his ballot the order of his choice. In the counting, as soon as it appears that a first-choice candidate needs no more votes, the second-choice candidate moves up into his place, being credited with the ballots until he in turn has reached his quota, and so on. Theoretically the smallest possible number of votes is wasted but in practice difficulty is experienced in large districts, since the ballot boxes must be brought to a central bureau to count the vote. There is also a considerable amount of chance in the order of counting the ballots. See also DISTRICT; APPORTIONMENT; CONGRESS; SENATE, UNITED STATES; HOUSE OF REPRESENTATIVES. Consult Commons, J. R., ‘Proportional Representation’ (New York 1907); Humphrey, J. H., ‘Proportional Representation’ (London 1911) and authorities cited under article ELECTIONS.

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MINOS, mī′nŏs, in Greek mythology, (1) a ruler of Crete, said to have been the son of Zeus and Europa. He was celebrated as a wise lawgiver and a strict lover of justice. (2) A grandson of the preceding son of Lycastus, son of the elder Minos and of Ida. This second Minos was the husband of Pasiphaë, whose unnatural passion gave birth to the Minotaur. He was king of Crete, but is not represented as having succeeded to the kingdom, but by one tradition as having acquired it through the favor of the gods, and by another as having conquered it over his brother Sarpedon. He is said to have made war upon the Athenians to revenge the death of his son Androgeos, who was killed at the festival of the Panathenæa by the candidates whom he had defeated at the games. Minos, having defeated the Athenians, exacted from them every year a tribute of seven youths and seven maidens, who were devoured by the Minotaur. Theseus delivered the Athenians from the burden of this tribute.

MINOT, mī′nŏt, **Charles Sedgwick**, American scientist: b. West Roxbury, Mass, 23 Dec. 1852; d. 19 Nov. 1914. He was graduated from the Massachusetts Institute of Technology in 1872, studied also at Leipzig, Paris, Würzburg and Harvard, was lecturer on embryology and instructor in oral pathology and surgery in the Harvard Medical School in 1880–83, instructor in histology and embryology in 1883–87, assistant professor in 1887–92 and professor from 1892. He invented two forms of the microtome, an instrument for the automatic preparation of sections for microscopical study. He was elected president of the American Society of Naturalists in 1894, and president of the biological section of the American Association for the Advancement of Science in 1901. Among his works are ‘Bibliography of Vertebrate Embryology’ (1893), and ‘A Laboratory Textbook of Embryology’ (1903).

MINOT, mī′nŏt, **George**, American lawyer: b. Haverhill, Mass., 5 Jan. 1817; d. Reading, Mass., 15 April 1856. He was graduated at Harvard in 1836 and at the Harvard Law School in 1838. He completed his legal studies with Rufus Choate and was admitted to the bar in 1839. He became a noted Boston lawyer and was for many years solicitor of the Boston and Maine Railroad Company. Mr. Minot edited ‘Digest of the Decisions of the Supreme Court of Massachusetts,’ 45 volumes with supplement (1844–52); with Richard Peter, Jr., eight volumes of the ‹United States Statutes at Large› (1848), and was for 10 years subsequently editor of that work. He was also associate reporter of the decisions of the first circuit and edited ‹English Admiralty Reports› (9 vols., 1853–54).

MINOT, George Richards, American jurist: b. Boston, Mass., 22 Dec. 1758; d. Boston, 2 Jan. 1802. After graduation at Harvard in 1778, he studied law with Fisher Ames and was admitted to the bar of Boston, where he practised his profession. From 1781 to 1791 he was clerk of the Massachusetts House of Representatives. In 1792 he was appointed probate judge for the county of Suffolk, also serving at the same time as secretary of the convention that adopted the United States Constitution. In 1799 he was made chief justice of the Court of Common Pleas, and judge of the Municipal Court of Boston on its establishment in 1800, holding this office until his death. One of the founders of the Massachusetts Historical Society, he edited three volumes of its *Collections.* He delivered the oration on the anniversary of the Boston Massacre (5 March 1782). He published ‹History of the Insurrection in Massachusetts in 1786› (Worcester 1786) and a ‹History of Massachusetts Bay,› a continuation of Hutchinson's ‹History of Massachusetts Bay› (2 vols., 1798–1803).

MINOT, N. Dak., city and seat of Ward County on the Mouse River, 196 miles west of Grand Forks. It is situated on the Minneapolis, Saint Paul and Sault Sainte Marie and the Great Northern railroads. Minot is an important trading centre. Here the time is changed from «Central» to «Mountain» time, according to the system adopted in 1883. Minot has a fine hospital and a United States land office. A term of the District Court is held here. Pop. (1920) 10,476.

MINOTAUR, mĭn'ō-târ, in Grecian mythology, the son of Pasiphaë, wife of Minos and a bull sent by Poseidon, having the body of a man with the head of a bull, or the head of a man and the body of a bull. He ate human flesh, on which account Minos confined him in the labyrinth built by Dædalus, and at first exposed to him criminals, but afterward the youths and maidens yearly sent from Athens as a tribute, until at length Theseus killed him, and freed the Athenians from this tribute.

MINOT'S LEDGE, or **COHASSET ROCKS,** in Massachusetts, a promontory and lighthouse in Boston Harbor. See LIGHTHOUSE.

MINSK, mĭnsk, Russia, city and government in extreme Western Russia. Minsk, the city and capital of the government, is on the Svisloch, 420 miles by rail southwest of Petrograd. It is the see of a Greek archbishop and of a Roman Catholic bishop. It has some manufactures of woolen cloth, hats, leather and a considerable general trade. Pop. 117,600. The government, bounded on the north and east by Vilna, Vitebsk and Mohilev; on the south and west by Chernigov, Kieff, Volhynia and Grodno, has an area of 35,220 square miles. Pop. 3,070,900.

MINSTER (Anglo-Saxon, *Mynster,* from monasterium) anciently signified the church of a monastery or convent. In Germany and in Great Britain this title is given to several large cathedrals, as York Minster, the minster of Strassburg, etc. It is also found in the names of several places, which owe their origin or celebrity to a monastery, as Westminster, Leominster, etc.

MINSTREL, a name introduced into England by the Normans, and which comprehended singers and performers of instrumental music, together with jugglers, dancers, sleight-of-hand performers and other similar persons. See NEGRO MINSTRELS; TROUBADOUR UNDER PROVENÇAL LANGUAGE AND LITERATURE.

MINT, a genus of perennial herbs (*Mentha*) of the family *Menthaceæ.* Many species have been described, of which 12 are either native or naturalized in America, characterized by square stems, opposite simple leaves, small, purple, white or pink, two-lipped, axillary flowers, in whorls which often form terminal spikes. All are noted for the fragrance of their foliage, due to the presence of an essential oil, for the production of which half a dozen species are more or less cultivated. The following are the most important ones: Spearmint (*M. spicata*), peppermint (*M. piperita*), pennyroyal (*M. pulegium*), bergamot-mint (*M. citrata*) and Japanese mint (*M. arvensis,* var. *piperascens*). Spearmint is the species most used as a culinary herb in the form of mint sauce served mainly with roasted lamb. Peppermint is largely employed in flavoring candy and for the production of menthol. Bergamot-mint is chiefly used in perfumery. Medicinal properties have been attributed to all of them, and they have all been cultivated upon a commercial scale to supply the various demands. Besides these cultivated species, which are frequently found as escaped plants near gardens, there are several other species, of which the following are perhaps best known: Round-leaved mint (*M. rotundifolia*), a native of Europe, naturalized rather interruptedly in the coast States from Maine to Texas; water mint (*M. aquatica*), with hairy stems, rather rare in wet places in New England and southward to Maryland; whorled mint (*M. sativa*) and its close relative, corn mint (*M. arvensis*), which are found in damp fields in New England; and wild mint (*M. canadensis*), which extends northward from the Northern States across the continent. All are recognizable by their resemblance to other members of the genus, especially by their odor. Several other related plants of other genera are called mint, among them being mountain mint (*Koellia spp.*), also popularly known as basil. The numerous species are widely distributed throughout the United States and Canada, and have a mint-like flavor and odor. Catnip (*Nepeta cataria*) is often called cat mint, and several species of *Monarda,* especially *M. punctata,* are known as horse-mint.

The half-dozen cultivated mints are managed alike. They will grow on any soil that will produce good crops of potatoes, but since they are considered exhausting crops are included in the rotation only once in five or more years. Upon reclaimed swamps, however, which are considered best adapted to their cultivation, they are generally allowed to remain consecutively for five years or even more without change of crop. The land having been plowed, harrowed and otherwise fitted, small pieces of the root-stock are dropped at intervals of a few inches in shallow furrows about 30 inches apart. All through the season the land is kept scrupulously free from weeds, especially of smartweed, fireweed, ragweed and horseweed, which seriously injure the product if included in the «hay» from which the oil is distilled. Hand-weeding is commonly practised after horse cultivation is stopped by the luxuriant vines. About midsummer, or when the earliest flowers appear, the tops are cut, either with scythes of sometimes with mowing machines, and cured like hay. They are then stored under cover for distilling. This process is usually conducted with steam, which enters the still below, passes upward through the mass of hay, carrying the essential oil with it, and condenses in coils of pipe chilled by running water. After condensation, the oil and water separate by gravity. After standing for a greater or less length of time, crystals of menthol (q.v.) appear in the oil of peppermint. The annual yield of oil per acre sometimes exceeds 50 pounds, and sometimes a second profitable cutting of the crop may be made in autumn. Having once been planted the crop takes care of itself from year to year. The most important producing centre is in southwestern Michigan and northwestern Indiana. Perhaps next is Wayne County, N. Y. Other important mint fields are at Mitcham, Surrey and Lincolnshire, England, and in Saxony, Germany.

MINT, a government establishment for the coining of lawful metallic money. The United States mint was established in 1791, and remained an independent department of the Federal government until 1873, when it became subordinate to the Treasury Department under the title of «The Bureau of the Mint.» This bureau is controlled by the Director of the Mint, who has general supervision of all the mint and assay offices in the country. He is the active manager, and formulates the rules of operation under which the bureau is run, but these rules require the approval of the Secretary of the Treasury before they become effective. Besides making the coined money of the country the United States mint makes metallic money for foreign nations, and also does considerable business in the line of supplying fine gold and silver in bars for industrial uses, and in making assays of bullion and ores of the precious metals for private owners.

During the fiscal year ended 30 June 1916, coining operations were carried on at the mints of Philadelphia, San Francisco and Denver. The mints at New Orleans and Carson City and the assay office in New York were operated as assay offices. The assay offices at Seattle, Boise, Helena, Salt Lake City and Deadwood were operated only as purchasing agencies for the active institutions. Refining was carried on at New York, Denver and San Francisco. The value of the gold acquired by the United States government at the mints and assay offices during the year cited was $508,083,262.92. The amount of the silver purchased was 654,516,196 fine ounces, costing $3,348,642.49.

The United States coinage for the year amounted to $37,209,062.83, of which $31,077,409 was gold; $3,328,882.50 silver; $1,790,468.15 nickel; and $1,012,303.17 bronze. These figures include the 19,534 one dollar gold pieces coined for the Panama-Pacific International Exposition. There were also coined for foreign nations, at the Philadelphia mint: For Cuba, 3,092,890 gold pieces; 11,574,450 silver pieces and 25,912,150 nickel pieces; for Colombia. 852,663 silver pieces; for Ecuador, 1,000,000 silver pieces; for Salvador, 1,000,000 nickel pieces; for Venezuela, 2,000,000 nickel pieces; and for Peru, 100,000 gold planchets and 500,829 silver planchets. The mint at San Francisco coined for the Philippines 1,435,000 silver pieces and 5,500,000 bronze pieces. No other minting institution in the world turns out annually so large a number of pieces of money nor an amount of money of so great a value as the United States mint.

The seigniorage for the year cited amounted to $4,046,740.26; the profits in the handling of old metal amounted to $280,259.72, and other profits amounted to $658,174.91, making the total receipts, $4,985,174.89. The operating expenses were $1,228,029.06. The net profits to the government from the mint were, therefore, $3,757,145.83.

The total value of money coined by the United States mint since 1793, the first year of its active operation, has been $4,494,094,087.68. Of this, $3,422,949,938.50 has been in gold; $995,956,436.30 in silver; and $75,187,712.87 in minor coins.

The process of manufacturing coins comprises several distinct operations: (1) melting the metal bullion and casting it into bars; (2) rolling the bars into strips or ribbons; (3) cutting out the round discs or planchets; (4) adjusting the weight of the individual planchets; (5) rolling the rim of the planchet; (6) annealing and cleaning the planchets with acid; (7) striking the impressions on the planchets; (8) weighing each finished coin. In the rolling machines the rollers are adjustable and the space between them is governed by the operator. About 200 ingots are run through per hour on each pair of rollers. When the rolling is completed the strip is about six feet long. As it is impossible to roll perfectly true it is necessary to «draw» these strips, after being softened by annealing. The drawing benches resemble long tables, with a bench on either side, at one end of which is an iron box secured to the table. In this are fastened two perpendicular steel cylinders. These are the same distance apart that the thickness of the strip is required to be. It is drawn between the cylinders, which reduces the whole to an equal thickness. These strips are now taken to the cutting machines, each of which will cut 225 planchets per minute. The press now used consists of a vertical steel punch. From a strip worth $1,100 about $800 of planchets will be cut. These are then removed to the adjusting room, where they are adjusted. After inspection they are weighed on very accurate scales. If a planchet is too heavy, but near the weight, it is filed off at the edges; if too heavy for filing, it is thrown aside with the light ones to be remelted. The planchets, after being adjusted, are taken to the coining and milling rooms, and are passed through the milling machine. The planchets are fed to this machine through an upright tube, and as they descend are caught on the edge of a revolving wheel and carried about a quarter of a revolution, during which the edge is compressed and forced up. By this apparatus 560 half-dimes can be milled in a minute; for large pieces the average is 120. The massive but delicate coining presses coin from 80 to 100 pieces a minute. These presses are attended by women. After being stamped the coins are taken to the coiner's room. The light and heavy coins are kept separate in coining, and when delivered to the treasurer they are mixed in such proportions as to give him full weight in every delivery. By law, the deviation from the standard weight, in delivering to him, must not exceed three pennyweights in 1,000 double eagles. See COINAGE.

The mint at Philadelphia was the sole United States mint from 1792 to 1833. It was located at 37 and 39 North Seventh street, and the actual coining was done in a brick building in the rear, which was erected by the government. These buildings were sold at auction in 1836. In 1835 the New Orleans mint was established. This was suspended in 1861, and was not reopened until 1879. Coining was again suspended there in 1909. The mint at Charlotte, N. C., was organized in 1838; suspended in 1861; and abolished in 1913. The San Francisco mint was established in 1853, and the Denver mint in 1862. The mint at Carson City was organized in 1870, but coinage was suspended there in 1893.

In Great Britain there was formerly a mint in almost every county. Besides the sovereign, barons, bishops and the principal monasteries exercised the right of coining. From the time of William the Conqueror the great bulk of the coining of Great Britain was done in London, but it was not till the reign of William III that all the provincial mints were abolished. The present mint on Tower Hill, in London, was erected between the years 1810 and 1815. The furnaces of the British, or Royal, Mint number 16 and are gas fired, consuming 15,000 cubic feet of gas per hour. In the five-year period 1911–16 there was melted in these furnaces precious metals to the amount of 9,900 tons. The London mint supplies the whole of the coinage of the British Empire, except Australia and the East Indies, which are supplied from branch mints at Sydney, Melbourne, Perth, Calcutta and Bombay. In France the number of mints was at one time considerable, and in the earliest times indefinite. Before the Revolution there were 27 mints, each of which had a letter or letters of the alphabet for its sign. In 1857 there were still seven French mints, namely, Paris, Bordeaux, Lille, Lyons, Marseilles, Rouen and Strassburg. In 1858 those of Lille, Marseilles and Rouen were abolished, and in 1860 that of Lyons, so that there were only three mints remaining in 1870, when Strassburg was taken by the Germans.

Consult Director of the United States Mint, ‹Annual Reports›; Watson, D. K., ‹History of American Coinage› (New York 1899).

MINT GERANIUM. See COSTMARY.

MINTON, Thomas, English pottery manufacturer: b. Wyle Cop, Shrewsbury, 1765; d. 1836. He was originally an engraver, having learned his art from John Turner, who had paid special attention to the process of printing on delft or chinaware. He settled at Stoke upon Trent in 1791 and founded a pottery factory with the object of producing glazed pottery in the highest style, which should compete with the productions of foreign countries. He was completely successful and the range of his manufactures was increased by his son, Herbert Minton (1793–1858), who succeeded him in 1836, and manufactured the famous «Parian» porcelain and the encaustic tiles, with which the name Minton is now most commonly associated.

MINUCIUS FELIX, Marcus, probably the earliest Latin apologist of Christianity. Although he is mentioned by Lactantius and Saint Jerome, practically nothing is known of his life except what may be gathered from his one known work, ‹Octavius,› a popular defense of Christianity in dialogue form. Almost all modern critics agree in putting the date of its composition before that of Tertullian's ‹Apologeticum› (197) which bears a close resemblance to it, although the matter has been the source of great controversy. Waltzing, who has published the best and most recent edition (Leipzig 1912) and made many other valuable contributions to the literature of the subject, places it between 160 and 185. There is an English translation in the ‹Ante Nicene Fathers.› The dialogue, which is modeled chiefly on Cicero's ‹De natura deorum,› takes place between three lawyers: the author (who acted as judge), Cæcilius Natalis (a pagan and native of Citra), and Octavius Januarius (like the author, a Christian convert and native of Africa). The three had left Rome during the autumn vacation for a sojourn at nearby Ostia, where on a walk along the strand the discussion was provoked by the saluting of a statue of Serapis by Cæcilius. By agreement he begins, giving an arraignment of Christianity which alleges the impossibility of man arriving at truth, the inexpediency of disturbing long-established religious beliefs (especially those which have been the cause of Rome's greatness), the want of culture among the Christians, the indecency of their worship and the inherent absurdity of their doctrines. Refuting these allegations point for point, Octavius, upon purely philosophical grounds and therefore without explicitly quoting the Holy Scriptures or mentioning the name of Christ or the mysteries of Christianity, treats of the creation, Providence, the unity of God, the absurdity of paganism, the resurrection and the reward after death. Cæcilius acknowledges himself vanquished, but wishes some further explanations to be made later. The dialogue, in spite of the inevitable traces of the general decadence of taste, attains a rare degree of elegance, grace and limpidity. The introduction especially is a masterpiece because of the naïveté and naturalness with which the stage is set. Saint Jerome speaks of another work appearing under the name of Minucius Felix, ‹De fatô vel contra mathematicos,› but believes that it is not genuine because of the difference in style. Minucius in his dialogue had promised a special work on fate and it may be that this inspired the publication under his name of a work that was not his.

Bibliography.— Waltzing, J. P., ‹Studia Minuciana› (Louvain 1906); Teuffel, W. F., Geschichte der römischen Literatur› (6te aufl., Leipzig 1913); Bardenhewer, Otto, ‹Les Péres de l'Église; leur Vie et leurs Oeuvres' (tome 3, Paris 1898); Salmon, George, 'Minucius Felix, Marcus' in Smith and Wace's 'A Dictionary of Christian Biography' (Vol. III, London 1882); Chevalier, Ulysse, 'Bio-Bibliographie' (Paris 1905).

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MINUET, mĭn'ū-ĕt', a graceful and stately dance of French origin, the name of which, derived from *menu,* small, was suggested by the little steps. It developed from the *branle* of Poitou and was introduced into Paris in 1650. It was at first a gay and sprightly dance; but after appearing at court it became grave and very dignified. It is mentioned by Beauchamps, father of dancing-masters, who flourished in the reign of Louis XIV, and also by Blondy, his pupil; but it was Pécour who gave the minuet popularity. The first known minuet tunes of artistic value were written by Lully (composer of ballets and operas) in 1653. The minuet was a great favorite at the court of Louis XIV, and was equally popular in the contemporary court of Charles II in England, where it continued in vogue into the reign of George II. The minuet reached perfection in the reign of Louis XV. It was then a dance for two persons, in moderate triple time, and was generally followed by the gavotte (q.v.). Afterward the minuet was considerably developed, and, with the gavotte, became chiefly a stage dance and a means of display. The original court minuet was a grave and simple dance, although it did not retain its simplicity for long. It was elaborated and molded into a beautiful form,— the perfect expression of an age in which deportment was carefully cultivated, manners were polished and bodily grace developed to the highest degree. The many slow graceful movements, the bows, the pauses to be filled with pretty compliments and the opportunity the dance gave for the display of beauty and bravery of costume made the minuet a factor in the polite world on both sides of the Atlantic. These court minuets were written in three-quarter time and consisted of two eight-bar phrases, each of which was repeated. Mozart's beautiful minuet in 'Don Giovanni' shows the form exactly. The form was soon extended. As a complement to the first movement, a second minuet was added, similar in form but contrasted in feeling. This, being usually written in three-part harmony, received the name of Trio, a name retained to the present time, long after the restriction as to the number of parts has been abandoned. A further enlargement of the form of the minuet consists of the extension of the number of bars to 16. Bach and Handel introduced the minuet into their suites and Handel also used it frequently as a concluding movement for the overtures to his operas and oratorios. Bach's minuets are remarkable for their variety of form and character. The historic importance of the minuet arises from the fact that it still holds its place in the symphony, the descendant of the suite. The first composer to introduce the minuet into the symphony appears to have been Haydn. Examples are also found in Haydn's string-quartets. Haydn, however, while retaining the form, changed the spirit and introduced a light-hearted humor. The form of Mozart's minuets is identical with Haydn's, but Mozart again changed the spirit and in his hands tenderness and grace take the place of mere exuberance. It is in Mozart's concerted instrumental works that his minuets are chiefly to be studied. Beethoven continued the popularity of the minuet. First he followed the form and general characteristics of Mozart, but gradually he transformed the minuet into the Scherzo; and in the great majority of symphonies since Beethoven, the Scherzo replaces the older form. Occasionally the minuet appears as in Mendelssohn's 'Italian Symphony' and in Schumann's 'E-flat Symphony.' The Italian composers were most successful in their use of this form. Among them was Boccherini (1743–1805), whose quintets contain gems that are still popular. The beautiful minuet in the last scene of Verdi's 'Falstaff' is a most happy adaptation of the old form to modern music.

MINUIT, mĭn'ū-ĭt, **MINUITS,** or **MINNEUIT,** mĭn'ē-wĭt, **Peter,** German colonist in America: b. Wesel, Rhenish Prussia, about 1580; d. Fort Christiana, New Sweden (Delaware), 1641. He was an official in America in the service first of the Dutch West India company and then of the Swedish West India Company. Appointed governor of New Netherlands by the Dutch West India Company on 19 Dec. 1625, he landed on Manhattan Island on 4 May 1626, purchased the island from the Indians for trinkets valued at approximately $24, built Fort Amsterdam and governed with a great degree of success until his recall in August 1631. The vessel on which he sailed was forced to put in at Plymouth, and he was imprisoned for some months on a charge of illegal trading. In 1633 the charter of the Swedish West India Company, originally granted in 1626, was renewed, and in 1637 Minuit, under the direction of the company, set sail from Gothenburg with 50 Swedish and Finnish colonists to found a colony in North America. He arrived at Delaware Bay in April 1638, purchased from the Indians the territory between the falls of the Delaware at Trenton and Cape Henlopen, called this region New Sweden, and built Fort Christiana, near the site of Wilmington, Del. The establishment of the colony aroused the resentment of the Dutch, by whom it was taken in 1655. Consult Mickley, 'Some Account of William Usselinx and Peter Minuit' (in 'Delaware Historical Society Papers,' Wilmington 1881).

MINUTE, a division of time and of angular measure; the 60th part of an hour, and the 60th part of a degree. In astronomical works minutes of time are denoted by the initial letter *m,* and minutes of a degree or of angular space by an acute accent ('). In architecture the 60th part of the diameter of a classic column, measured at the base.

MINUTE MEN, in the American Revolutionary War, the militia, who were prepared for service at a minute's notice. They were principally civilians, resident in Massachusetts, who were enrolled in accordance with an act of the provincial congress, passed 23 Nov. 1774. There were in Boston alone 16,000 minute men ready for service.

MINYAS, mĭn'ĭ-as, in Greek mythology, the son of Chryses, the hero of the *Minyæ,* from whom were descended most of the Argonauts. His three daughters, Clymene, Iris and Alcithoë, or Leuconoë, Leucippe, Alcithoë, were changed into bats for having made light of the mysteries of Dionysus.

MIOCENE, *in geology,* the third epoch of the Tertiary period, intermediate between the older Oligocene and the newer Pliocene. Considered in respect to its invertebrate (fossil) fauna the earlier part of it («lower» Miocene) forms a part of the Oligocene (q.v.); but no such distinction can be made when the period is judged by its vertebrate remains. (See Tertiary). Marine beds of Miocene Age are known on the Atlantic and Gulf Coastal Plain of the United States, showing that the eastern edge of the continent was under water. Marine Miocene is also known on the Pacific Coast, the western margin of the continent also being submerged. In the Rocky Mountains and Great Plains, terrestrial gravels, sands and clays accumulated, in part in lakes, in part on flood plains. The great lava flows of the Columbia Plateau and the Yellowstone Park Region are of this age. In Middle or Late Miocene came the folding of the Coast Ranges, and probably simultaneously came the uplift of the Alps, the Apennines, the Caucasus and the Himalayas.

MIOHIPPUS, a fossil horse of later Miocene time. See Horse, Evolution of.

MIOTIC, a word that notes or characterizes the stage in the life-history of an organism at which miosis, or reduction, occurs; in other words it is the suppression of an entire whorl of floral organs. The term is also applied to vegetable alkaloids used in medicine to cause contraction of the pupil of the eye, mydriatics being the designation of drugs which cause dilation. Consult Mann, A., ‘Preparation of unbroken Mother-cells and other Cells for Studies in Miosis› (in *Science,* Vol. XXXVI, n. s. 1912).

MIQUELON, mēk-lôn̄, an island in the Atlantic Ocean, near the southern coast of Newfoundland, at the entrance of Fortune Bay, with Saint Pierre (q.v.) forming a French colony. The southern part of it is called Little Miquelon (*Petite Miquelon*) or Langley Island, and was once a separate island, but since 1783 has been connected with it by a sandbank. The island was discovered by Sebastian Cabot in 1497, and is a French possession. It is under the direction of the commandant of Saint Pierre and is occupied only by a few families engaged in the fisheries. The area of Miquelon is 83 square miles. Pop. about 600.

MIR, mēr, in Russia, a name given a commune, consisting of the inhabitants of one or more villages, who are as a community owners of the surrounding land which is redistributed to the members from time to time, and who are mutually liable for the taxes. The mir is self-governing as a community, with elective officers, but is subject to bureaucratic control.

MIRA, mī'rạ or mē'rạ, or **STELLA MIRA** (the wonderful star), in astronomy, the star Omicron Ceti, a remarkable variable, situated in the neck of «the whale.» Its variability was discovered in 1596 by Fabricus. The period is somewhat irregular, but averages about 331 days. During the greater part of this time the star remains of about the 9th magnitude, but during about 100 days it rises to a maximum which may vary from the 2d to the 5th magnitude, remains for a week or 10 days there, and then sinks to its minimum again. When shining with a brightness of the 2d magnitude, it is giving out more than 600 times as much light as when at the 9th magnitude. Its greatest recorded variation occurred between the years 1779 and 1783, when, after attaining a brightness equal to that of the first magnitude star, Aldebaran, it sunk so low that it was invisible, even in telescopes showing stars of the 10th magnitude. The period of its changes is also irregular, sometimes varying to the extent of two months. Thus, neither the times of greatest brightness nor the amount of the brightening can be accurately predicted.

As to what occurs in this and similar long period variables to occasion so great an outburst of light at the approximately constant interval of about 11 months, we are ignorant. As the time of greatest brightness of Mira approaches the spectrum gives evidence of powerful disturbance, and the outburst is from the depths of the sun, the outlying strata of vapors remaining comparatively cool. A periodical surging of the material of the ball of the sun is thus suggested, and this so widespread as to amount to a real bodily distortion rather than to a mere tide, but the cause of this disturbance we do not know.

MIRABEAU, Gabriel Honore Riquetti, gā-brē-ĕl ō-nō-rā rē-kĕt-tē mē-rä-bō, or mĭr'ă-bō, Comte de, French orator and Revolutionary leader: b. Bignon, near Nemours, 9 March 1749; d. Paris, 2 April 1791. In 1767 he entered the Berry cavalry regiment, was promoted 2d lieutenant, but on account of misconduct was later imprisoned on the island of Ré until March 1769. He then joined the expedition to Corsica, in 1771 was commissioned captain of dragoons and in 1773 was married. In 1774 he was imprisoned in the Castle of If, owing to debts and quarrels with his wife and father, and the next year was transferred to the Castle of Joux, near Pontarlier. Here he fell in love with the young wife of the Marquis de Monnier; trouble ensued and Mirabeau finally escaped to Switzerland, where he was joined by his mistress, Sophie, as he called her, and in October 1776 they settled in Amsterdam. In May 1777, however, they were arrested, brought to Paris and Mirabeau was imprisoned for three years and a half at Vincennes, being released in December 1780. After Mirabeau had forsaken her, Sophie committed suicide in 1789. Having secured the revocation of the death sentence imposed upon him for the seduction of Sophie, and being legally separated (1783) from his wife, he left France for a few months.

Upon Mirabeau's return he began his lifelong intimacy with Henrietta van Haren, known as Mme. de Nehra, whose influence was undoubtedly exerted to his great benefit. In August 1784 he was forced to flee to London to allow more trouble to blow over, and while there wrote the ‘Considérations sur l'ordre de Cincinnatus.› About 1784 he began to devote himself to politics, visited London, was entrusted by Calonne with a secret mission to Prussia, and published various treaties, which made him sufficiently well known to the *tiers* *état* to be elected by the town of Aix to be its representative in the States-General of 1789. Here he speedily eclipsed all the other orators of the Assembly, and became the centre round which gathered all the men of greatest mark and force of character in the third estate. He was the immediate cause of the French Revolution, by the resistance which he offered to the demand of the king after the royal sitting of 23 June 1789, that the third estate should vote separately from the other two orders. It was on this occasion that he gave the vigorous reply to the grand-master of ceremonies, who had communicated to the Assembly the royal will, concluding with the words, «Go and tell your master that we are here by the will of the people, and that no one shall drive us out except by the force of bayonets.» Both before and after this occasion he delivered many eloquent speeches, which obtained for him the title of the «French Demosthenes.» Among the most remarkable of these are his address to the king demanding the removal of the troops encamped at Versailles, speeches on the national bankruptcy, on the civil constitution of the clergy, on the royal sanction, on the right of peace and war, and his reply to the Abbé Maury on ecclesiastical property. After having shown himself a bold reformer, and the most dangerous adversary of the court, Mirabeau ended by offering his support to the throne; the court paid his debts and supplied him with funds, although he continued to make a show of opposition to royalty in order to uphold his popularity. This state of matters dates from May 1790. It appears to be true that in this change of position he acted from conviction, foreseeing the imminence of a great catastrophe, which he desired if possible to avert. Whatever may have been his motives, this conduct, when it became known, naturally raised up against him numerous enemies. But on 30 November he was elected president of the Jacobin Club, and on 29 Jan. 1791 of the National Assembly. His remains were buried with great pomp in Sainte-Geneviéve Church (the Pantheon), but three years later they were exhumed to make room for those of Marat. Mirabeau's aim was to make France a constitutional monarchy after the English pattern. Statesmanship and oratorical powers were marvelously combined in him. Mme. de Staël said of him that his speech was «like a powerful hammer, wielded by a skilful artist, and fashioning men to his will.» His speeches, however, were not his own altogether: a group of his friends united to supply him with the framings, and these he suffused and sublimated with his own genius.

Bibliography.— ‘Mémoires biographiques, littéraires et politiques de Mirabeau,’ by his adopted son, Lucas de Montigny (1834–35); and ‘Correspondance entre le Comte de Mirabeau et le Comte de la Marck pendant les années 1789–91’ (1851). Other important works on Mirabeau are Mérilhou, ‘Essai sur la vie et les ouvrages de Mirabeau’ (1827); Reynald, ‘Mirabeau et la Constituante’ (1872), Louis and Charles de Loménie, ‘Les Mirabeau’ (1878 and 1889); Aulard, ‘Mirabeau’ (1882); A. Stern, ‘Das leben Mirabeaus’ (1889; Fr. trans. 1895); Mézières, ‘Vie de Mirabeau’ (1892); ‘Carlyle, ‘French Revolution’ and ‘Essays on Mirabeau’; Willert, ‘Mirabeau’ (1898); Tallentyre, ‘Life of Mirabeau’ (1908); Trowbridge, ‘Mirabeau the Demigod’ (1907), and the bibliography in the translation from the French of Louis Barthon's ‘Mirabeau’ (1913).

MIRABILITE. A mineral consisting of hydrous sodium sulphate or glauber salt, $Na_2So_4.10H_{20}O$, occurring in the United States in Arizona, California, Oregon, Wyoming. Used to some extent for manufacture of soda.

MIRACLE PLAYS. The earliest dramatic representations of religious themes grew up within the Church itself. At certain seasons of the year, tableaux of gospel scenes were shown to the people, a practice which still survives in the representations of the Nativity in modern Catholic churches. The introduction of action and music into these tableaux is easy to understand, particularly in view of the dramatic elements in the celebration of the Mass, and in the ritual for special occasions, like the consecration of a church. Tropes or simple texts set to music were added to the regular service, and gave a further opportunity for dramatic scenes. In time these tropes grew more elaborate, passages in the vernacular were introduced and popular elements not taken from the Bible were added. Meanwhile, the little plays, which in the beginning had been given in the choir, were transferred to the nave, and set up against the pillars. So popular did these representations become, and so great was the concourse of spectators, that a move outside the building into the churchyard had to be made. Secular elements crept in very rapidly, and the plays were finally transferred to open spaces in the cities and towns. The liturgical drama reached its height in the 13th century; by the beginning of the 14th century it had largely passed out of the hands of the clergy, although representations continued to be given in many churches.

The growth of the miracle play in England is due to the influence of the Normans. There are almost no evidences of dramatic impulse in England before the Conquest. The earliest play of which there is mention by name is a ‘Play of Saint Katherine,’ at the beginning of the 12th century, produced under the direction of a Frenchman who afterward became abbot of Saint Albans. To the same century belongs the work of Hilarius, a pupil of Abelard, and perhaps of English birth. He wrote Latin plays on subjects taken from the Scriptures, and diversified them with refrains in Old French. It seems probable that French plays may have been acted in England at this time, but none are extant.

The term «miracle play» is properly applied to the religious plays which developed in England out of liturgical beginnings. They have sometimes been called «mysteries,» but this term, which is more generally and rightly used of productions in France, does not antedate the 18th century in England, the mediæval name being *miraculum*, or *miracle*. A great impetus was given to the plays by the institution of Corpus Christi Day, with its elaborate processions and outdoor ceremonial, and many came to be presented at this season, when the conditions of weather were likely to be favorable. In time the procession served as a mere preliminary to the dramatic performances to follow. A desire for more elaborate stage effects and a greater number of incidents within the plays was constantly increasing, until there developed out of the relatively simple early pieces long groups of plays of cyclic character, covering the principal events of the Scripture narrative, in both the Old and the New Testament. The series given at York in 1415 begins with the Creation, and ends with the glorification of Mary and Jesus in heaven, embracing 48 separate pieces in all. These cycles were often not all given on one day, but extended over two or more days, or they were divided, and presented in succeeding years.

After leaving the churches, the plays soon passed into the hands of the guilds, or associations of tradesmen. In the 13th century clerics were forbidden by papal edict to appear on the stage, but these prohibitions were frequently disregarded. The control of the plays by the guilds marks a period of great importance in the history of the English drama. Much care was devoted to the production and acting of the various pieces. The corporation of the city had general charge of the matter, deciding when the performances should be given, and dividing the various scenes among the several companies. An effort was made to have the play suit the character of the guild that gave it; the shipwrights showed the building of the Ark, the waterman the Flood, and so forth. The plays were given on movable stages called *pageants,* which consisted of «high scaffoldes with two rowmes,» one beneath which was used as a dressing-room, and one above, open on all sides to give a better view, and occasionally provided with a canopy. These wagons moved from place to place, repeating the performance at different stations. The number of these stations varied with the size of the town; there were sometimes a dozen or more. The pageant wagons were gaily painted and decorated. They were generally rectangular, but special shapes were required for the Ark, or for Hell-Mouth, a huge painted head with open jaws belching fire and smoke. The scenery was of a rude sort. Palaces, temples and castles were sometimes represented by boxes or wickerwork covered with cloth. Occasionally the actors made use of the open space in front of the pageant; Herod's «raging» appears to have been partly done in the street. The costumes were often expensive, but frequently grotesque. Herod was attired like a Saracen, with red gloves. Pilate always wore a green cloak and wielded a huge club. God the Father was represented in person, and dressed all in white, with a gilt wig. The devils and the Evil One were made very realistic, and came to furnish a great deal of low comedy. Various accounts of sums paid for properties and costumes are still preserved.

Four cycles of miracle plays are still extant, the York, Chester, Coventry and Towneley or Woodkirk plays. The Towneley series, so called from the family who long owned the manuscript, much resembles the York cycle, and like it displays much vigor and humor. The Chester plays perhaps appeal most to modern taste. The religious passages are more reverent, the humor less coarse and the versification less harsh. The Coventry plays are full of didacticism; and this, with the introduction of personified abstractions, relates them more closely than the others to the Moralities. Fragments of other cycles have also survived. The Vulgate and the Apocrypha are the chief sources of the texts. In places some tragic elevation is reached, marred, however, by repetition and moralizing. Melodramatic and ranting scenes were popular. The comic scenes are often very spirited, and clearly based upon observation of the life of the people. Anachronisms are common, and the supernatural is treated with great naïveté.

The miracle plays were at their best in the time of Chaucer. In the 15th century the Moralities arose to compete with them for favor, but never equaled them in dramatic achievement. The miracle plays continued to be given until the beginning of the 16th century, but in the reign of Elizabeth they had ceased to be a vital force. Their influence in preparing the way for the Elizabethan drama was very great, however. They introduced elementary types of comedy and tragedy, farce and melodrama, and accustomed the people as a whole to dramatic conventions. They made a national drama possible in the time of Shakespeare, and kept the theatre from being a mere amusement for the nobility, or a diversion for a small group of literary people.

Bibliography.— Chambers, ‹The Mediæval Stage› (2 vols.); ‹Chester Plays,› edited by Wright (London 1847); D'Ancona, A., ‹Sacre rappresentazioni dei secoli 14–16› (Florence 1862); Davidson, Charles, ‹Studies in the English Mystery Play› (New Haven 1892); ‹Digby Mysteries,› edited by Furnivall (London 1882); Gayley, C. M., ‹Plays of Our Forefathers› (New York 1907); Hemingway, S. B., ‹English Nativity Plays› (in ‹Yale Studies in English,› Vol XXXVIII, New York 1909); Jusserand, J. A. J., ‹Literary History of the English People› (ib. 1895); Mackenzie, W. R., ‹English Moralities› (ib. 1914); Manly, J. M., ‹Specimens of the Pre-Shakespearean Drama› (Boston 1897); ‹Miracles de Notre Dame,› edited by G. Paris and Robert (Paris 1876–81); Moore, E. H., ‹English Miracle Plays and Moralities› (London 1907); Pettit de Julleville, Louis, ‹Les Mystères› (in ‹Histoire du théâtre de France,› 2 vols., Paris 1886); Pollard, A., W., ‹English Miracle Plays, Moralities and Interludes› (5th ed., Oxford 1909); Stoddard, F. H., ‹References for Students of Miracle Plays and Mysteries› (Berkeley 1887); Symonds, ‹Shakspere's Predecessors in the English Drama›; ‹Towneley Mysteries,› edited by Raine (Newcastle 1836); Ward, A. W., ‹History of English Dramatic Literature› (3 vols., New York 1899); Wright, ‹Early Mysteries› (London 1831); ‹York Plays,› edited by L. T. Smith (Oxford 1885).

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MIRACLES, works which excite wonder, because they are beyond ordinary human experience and appear to contravene the known laws of nature.

The well-known argument of Hume against the credibility of a miracle has often been refuted. A miracle, he said, was contrary to experience, but false witnesses in history are not contrary to experience; it is less probable that the miracle is true than that the witness is false. There are two fallacies in this reasoning; it begs the question by the use of the words contrary to experience, for the point at issue is whether miracles are contrary to experience or no. If they are contrary to Hume's experience, may it not be because his experience is limited? He has not lived at an age when a new religion was instituted and extraordinary guarantees demanded in order to accredit it with a hostile world. Even mankind's experience in nature is becoming widened every year, and many wonderful things take place at this moment which our ancestors of a century ago would have looked upon as magical or miraculous, such as wireless telegraphy, communication by telephone, the effects of the Roentgen rays, the power of radium, etc. For miracles are not to be looked upon as a violation of the laws of nature, but merely as the interposition of a higher law overruling a lower one. To those who believe in an intelligent creator and conserver of the world there can be no difficulty in apprehending the possibility of the miraculous; even those who like Herbert Spencer have a vague belief in what they style Force or Power underlying all the operations of nature should not hesitate in admitting that the force which keeps up the multitudinous activities of the universe may manifest itself at times in unprecedented fashions, even as the new discoveries and combinations of science are constantly revealing new powers in the domain of natural law.

Pascal has said that the certainty and genuineness of certain miracles is proved by the falsity of others, meaning presumably that the very fact that general human consent has been given to the idea of miracles proves that such idea has a counterpart in reality. There are of course certain concomitant circumstances which may be taken as affecting the credibility of a miracle. Most of the miracles of history may be put aside as inventions; such are many of the stories told by Livy and Herodotus, and the wild fables of Hindu history, as well as many miraculous incidents in the life of Mohammed. Christian apologists lay particular emphasis on the moral aspects of the miracle. To those who deny or doubt the existence of a supreme being, the moral ruler of the universe, a miracle is an impossibility. On the other hand, without miracles the revelation of God is impossible. Hence, a miracle with a moral object is most in accordance with the character of a Supreme Being governing the world with a moral end. All idle or superfluous miracles are to be rejected as at variance with the character of such a being. Equally to be rejected are miracles which are merely tentative, that is, sometimes successfully accomplished, sometimes ending in failure; as well as others which are doubtful in their nature and those which are merely exaggerations of natural events.

In the early Church those who defended Christianity against the attacks of those outside laid great stress on the evidence of miracles, and claimed that miraculous power still existed among Christians. Irenæus asserted that this power was universal among Christian churches. Saint Augustine asserts the reality of the miraculous on the testimony of his own experience. He makes the acute remark that a miracle is not contrary to nature but to what we know of nature. The schoolmen did not agree with Augustine on this point. Thomas Aquinas defines a miracle as «something out of the order of nature.» Albertus Magnus declares that God has implanted the possibility of miracles in the very nature of things, although denying that he can do anything contrary to nature. Luther puts the miracle of grace in the heart far above any physical miracle, while he assigned the Bible miracles their proper place in the development of the faith. The Roman Catholic Church has always claimed the possession of miraculous powers and continues to do so to this day. The Socinians and Arminians maintain that God has always revealed himself by means of supernatural works, and Grotius in his defense of Christianity makes miracles the foundation of his argument. There has always, however, been a school of rationalists or philosophers who have opposed or attacked the belief in miracles, although Leibnitz admitted this belief into his philosophical system. He defines a miracle as an event inexplicable by natural causes. The laws of nature, he says, are not necessary and eternal; God can for his own purpose suspend them; the miraculous is included in the divine plan and forms a part of «the pre-established harmony.» Spinoza made the statement that miracles are impossible. In his pantheistic philosophy nature and her laws are identical with the will, intelligence and nature of God, who cannot work contrary to the laws of material nature. Kant like the English Deists did not deny the possibility of miracles, for they might be wrought by powers and in accordance with laws of nature with which we are unacquainted, but believed that such laws were never exercised. Schleirmacher contests the apologetic value of miracles and endeavors to eliminate the miraculous from the Christian scheme, which he thinks is lowered by this supernatural element. The modern agnostic claims that the advance of science has made a belief in the miraculous impossible. Some have tried to explain the recorded miracles of Scripture by a reference to natural causes; others would treat them as allegories or legendary accretions or folktales, or attribute them to self-deception, or fraud, or the credulous exaggeration of bystanders and witnesses. Miracles are regarded by conservative theologians as an essential part of Christianity which cannot be explained away or eliminated without destroying its authority. The more advanced theologians claim the right to question the reality of miracles, even including the virgin birth of Christ and the resurrection, and they regard as the matter of supreme importance the fact that Christ spiritually still lives and is transfiguring the life of mankind. Certain it is that miracles no longer hold the place they once did as Christian evidences; conversion, the «expulsive power of a new affection» vivifying and transforming the soul, the divine response to prayer, communion with God and the supreme miracle of Christ himself as the spiritual regenerator of mankind — these have placed outward signs and evidences into a subordinate place.

Bibliography.— There is an inexhaustible list of works on the subject; but in addition to authorities named in the article consult Arnold, Matthew, 'Literature and Dogma' (new ed., London 1902); Balfour, A. T., 'Foundations of Belief' (1895); Bonney, T. G., 'The Present Relation of Science and Religion' (ib. 1913); Bruce, A. B., 'The Miraculous Element in the Gospels' (ib. 1886); Davies, E. O., 'The Miracles of Jesus' (ib. 1913); Gordon, G. A., 'Religion and Miracle' (Boston 1910); Headlam, A. C., 'The Miracles of the New Testament' (ib. 1914); Illingworth, J. R., 'Divine Immanence' (ib. 1898); 'The Gospel Miracles' (ib. 1915); Figgis, J. N., 'The Gospel and Human Needs' (New York 1910); Lecky, 'Rise of Rationalism' (London 1865); Lodge, Sir Oliver, 'Man and the Universe' (ib. 1908); McCosh, 'The Supernatural in Relation to the Natural' (ib. 1862); Mozley, J. B., 'Eight Lectures on Miracles' (ib. 1865); Newman, J. H., 'Two Essays on Miracles' (ib. 1873); Orchard, 'The Attitude of Science Toward Miracles' (ib. 1910); Pfleiderer, 'Philosophy and Development of Religion' (ib. 1894); 'The Early Christian Conception of Christ' (ib. 1905); Saintyres, 'Le discernement du miracle' (Paris 1909); Trench, R. C., 'Notes on the Miracles of Our Lord' (London 1847); Wallace, A. R., 'Miracles and Modern Spiritualism' (ib. 1896); Wendland, 'Miracle and Christianity' (ib. 1911).

MIRAGE, mĭ-räzh', the name given to certain illusory appearances due to the bending of rays of light in the atmosphere. The earliest attempt to explain the mirage seems to be that of Monge, who accompanied Bonaparte's Egyptian expedition; he thus describes what was observed by the French soldiers: «The villages seen in the distance appeared to be built upon an island in the midst of a lake. As the observer approached them the boundary of the apparent water retreated, and on nearing the village it disappeared, to recommence for the next village»; he attributed the phenomenon to the hot sand of the desert keeping the lower layers of the atmosphere at a less density than the upper ones; the rays of light from the lower parts of the sky and objects in the distance arrive at the surface separating the less dense layer of air from those above, and are there subjected to total reflection; the eye sees the sky in the direction of the received rays, and this gives rise to the idea of a lake.

It is often assumed that rays of light pass through the atmosphere in straight lines; this is approximately true for short distances, but astronomers and surveyors have to correct their observations for refraction. By the laws of optics it is easy to see why a ray passing obliquely through the atmosphere, when this is arranged in horizontal layers of equal density (those of greater density being lowest), should bend, and that a vertical ray should not bend; but optics does not tell us why a horizontal ray is much more refracted than an oblique one. The explanation (first given by Dr. James Thomson) is easy on the undulatory theory of light. The wave front of a horizontal ray of light is at right angles to the ray, and is a vertical plane; now light is less rapidly propagated in the lower layers of air, hence the lower part of the wave front is retarded, and when the light has proceeded some distance its wave front is no longer vertical, and the ray has bent downward (the ray is always supposed to be normal to the wave front). Thus, in the atmosphere in its normal state the path of a ray of light is always slightly concave downward. Professor Everett thus explains the appearance of «castles, obelisks and spires,» cities with many buildings, forests of naked trees and great basaltic precipices sometimes assumed by irregularities in cakes and fields of ice. It sometimes happens that several inverted images of an object are seen in the same sky; these may be accounted for by assuming that there are several layers of air, in each of which there is a rapid variation (an increase upward) of the index of refraction. Mirages are not uncommon in California, Nevada and Alaska.

MIRAMICHI, mĭr"a-mĭ-shē', Canada, a river of New Brunswick formed by the junction of the northwest and southwest Miramichi, about 35 miles above its mouth in Miramichi Bay on the Gulf of Saint Lawrence. The northwest affluent rises in the highlands east of the Nepisiquit and is about 90 miles long, 16 miles of which are influenced by the tides. The southwest or main headstream flows from a lake near the Tobique, and fed by numerous rivulets draining a lake district becomes a considerable river 185 miles long to its confluence with the northwest branch. The Miramichi is navigable 40 miles from its mouth. Salmon, trout and other varieties of fish abound in the river and its tributaries.

MIRAMON, Miguel, mē-gĕl' mē-rä-mōn', Mexican soldier: b. City of Mexico, 29 Sept. 1832; d. Querétaro, 19 June 1867. He was educated in the military school of Chapultepec in 1846; was a volunteer in the war with the United States; became a colonel in the Mexican army; deserted with his regiment to take part in the revolt at Puebla in 1856; and for that was degraded when Puebla was taken by Comonfort. In October 1856 he headed another revolt at Puebla, in 1856–58 was conspicuous in the party of the reactionists and was chosen by the electoral junta to succeed Zuloaga as President 2 Jan. 1859 (entered office 2 February). He continued to take part in the «war of reform» in 1859–60, but was defeated at Calpulalpam, near Mexico, 22 Dec. 1860, by Ortega, and fled to the coast, sailed to Europe and probably was concerned in the plans of Napoleon III for an invasion of Mexico. Maximilian appointed him grand-marshal and Minister to Berlin. Later he was given a high command in the imperial army and conducted with Maximilian the defense of Querétaro. He was captured on the surrender of the city and shot with the emperor.

MIRANDA, mē-rän'dä, **Francisco Antonio Gabriel,** Venezuelan revolutionist: b. Caracas, 9 June 1756; d. Cadiz, Spain, 14 July 1816. In 1773–82 he was an officer in the Spanish army and then served with the French allies in the colonies in the Revolutionary War (1779, 1781). A general of division in the French republican army (1790–93), he was tried, but acquitted, on a charge of treachery at Neerwinden. He began a scheme for obtaining the independence of Spanish South America, founded the important society Gran Reunión Americana, which included many names later prominent in the South American revolution, and in 1806 made a futile attack on the Venezuelan coast. In 1810, on the breaking out of the revolution in Venezuela, he returned; in 1812 he was made President, but on 25 July capitulated to the royalists. He was sent to Spain and there remained a prisoner. Consult Biggs, ‘History of Don F. Miranda's Attempt to Effect a Revolution in South America’ (1809); Baralt, ‘Historia de Venezuela’ (1841); Robertson, ‘Francisco de Miranda and the Revolutionizing of Spanish America’ (Washington 1909).

MIRANDOLA, mē-rân'dŏ-lạ, Italy, town in the province of Emiliana, 17 miles northeast of Modena. It was the home of the Pico family, who held the town from the 14th century to 1710, when Joseph I of Austria took possession. The Pico castle is now in ruins. The cathedral, dating from the end of the 16th century, has been restored. The Palazzo del Commune is a Gothic building of the 15th century. The church of Gesu is also interesting. The chief industries are silk, rice and cattle-raising. Pop., commune 16,740.

MIRBEAU, mē'bō, **Octave Henri Marie**, French novelist and playwright: b. Trevières (Calvados), 16 Feb. 1850. He was educated in a Jesuit school at Vannes, studied law in Paris and became dramatic critic on the Bonapartist paper, *L'Ordre*. For a time he was *sous-préfet* and then *préfet* of Saint-Girons; but after 1877 he devoted himself to literature. His journalistic career was stormy and his attacks on established reputations involved him in several duels. He gradually developed extreme views. In 1890 he wrote for the *Revolte* and he was one of the first and most persistent defenders of Capt. Alfred Dreyfus. He was also one of the earliest supporters of the Impressionist painters. In 1887 he married the actress, Alice Regnault. Mirbeau first attracted attention as a fiction writer by his series of tales of the Norman peasantry, ‘Lettres de ma chanmière’ (1886), although he had previously published a novel, ‘Jean Marcellin’ (1884). He then published ‘Le Calvaire’ (1887); ‘L'Abbé Jules’ (1888); ‘Sebastien Roch,’ a bitter picture of the Jesuit school in which he had passed his youth (1890); ‘Le Jardin des supplices,’ a Chinese story (1899); ‘Les Mémoires d'une femme de chambre’ (1901); ‘Les Vingt-et-un jours d'un neuraschénique’ (1902); and ‘Dans l'antichambre’ (1905). In 1897 ‘Les mauvais bergers,’ a five-act drama, was played at the Renaissance by Sarah Bernhardt; and he gained a great success with his next play, ‘Les affaires sont les affaires’ (1903), represented in New York under the title ‘Business is Business’ (1905). Some of his short plays appear in his book, ‘Farces et Moralités’ (1904). ‘Le foyer’ (1909) was suppressed by the censor. ‘Dingo’ was published in 1913.

MIRFIELD, England, town and district five miles northeast of Huddersfield, on the Calder, in the West Riding of Yorkshire. It is one of the chief railway centres in the country and has manufactures of woolen and cotton goods, carpets and blankets. In the vicinity are coal mines. The church of Saint Mary's was completed in 1874 from designs of Sir Gilbert Scott. The tower of the ancient church remains. Pop. 11,702.

MIRIAM, the sister of Moses and the eldest of the family, is first mentioned as being stationed by her mother to watch her brother's cradle among the sedges on the river's brink. Later she procured her mother as nurse for the child when found by the princess. After crossing the Red Sea she is mentioned as «Miriam the Prophetess,» and she takes the lead with Aaron in the complaint against Moses for his marriage with a Cushite. For this action she was stricken with leprosy, but later the curse was removed and she died toward the close of the wandering in the desert. She was buried in Cadesh.

MIRKHOND, mēr'kônd, **Haman Ed Din**, Persian historian: b. 1433; d. 1498. He was the son of a pious and learned man of an old Bokhara Sayyid family, direct descendants of Mohammed. From an early age he devoted himself to history and literature; and in Herat, where he spent the greater part of his life, he gained the favor of a famous patron of letters named Mir Alishir. About 1474, in the quiet convent of Khilasiyah, which his patron had founded in Herat, he began his great work on universal history, the ‘Rauzat-us-safa’ (Garden of Purity), a collection of biographies of prophets, kings and caliphs from mythical times to 1523. Although written in a flowery and bombastic style and with no attempt at critical examination, the ‘Rauzat’ is ranked as one of the most remarkable of literary achievements. It is composed of seven large volumes and a geographical appendix. As the seventh volume contains accounts of events after Mirkhond's death, it is supposed to be the work of his grandson, the historian Khwandamir (1475–1534), who probably finished the appendix. The entire ‘Rauzat’ has been lithographed in folio (Bombay 1853 and Teheran 1852–56), and with Turkish translation (Constantinople 1842). The ‘Rauzat’ has been translated by various hands: ‘The Early Kings of Persia’ by D. Shea (London 1832); the Sassanids into French by S. de Sacy, ‘L'histoire de la dynastie des Sassanides’ (Paris 1793) and also by Jaubert (Paris 1843); ‘Histoire des Samanides,’ by Defrémery (Paris 1845); ‘Histoire des Sultans Ghurides,’ by Defrémery (Paris 1844); Seljuks into German by Vullers (Giessen 1837); and the story of Mohammed by Rehatsek, into English (5 vols., London 1891–94), the latter was rendered from English into French by Lamairesse (Paris 1894). For the life of Mirkhond, consult De Sacy, ‘Notice sur Mirkhond’ in his ‘Mémoires sur diverses antiquités de la Perse’ (Paris 1793); Jourdain, ‘Notices et extraits’ (Vol. IX, Paris 1812); and Elliot, ‘History of India,’ Vol. IV.

MIRROR, a smooth surface usually of glass, capable of regularly reflecting rays of light. A mirror may be (1) a polished surface of glass; (2) a surface of tin-foil on the further side of a sheet of glass (as in the common looking-glass); (3) the surface of a deposited film of silver or platinum on a polished glass surface, so that rays of light to and from the metallic reflecting surface do not pass through the glass; (4) a polished surface of silver, gold, platinum or speculum metal (a bronze composed of about 32 parts of copper to 15 of tin, small quantities of lead, antimony and arsenic being sometimes added).

The use of a reflecting surface would become apparent to the first person who saw his own image reflected from water; and for primitive man the only mirrors were probably his own reflection in the still water of ponds and lakes. The use of mirrors of brass by the Hebrews is mentioned in the Pentateuch; and bronze mirrors were used by the Egyptians, Greeks and Romans. The use of silver in the manufacture of mirrors was taught by Praxiteles in the 4th century before Christ. Looking glasses were first made in Venice in A.D. 1300, and in 1673 were introduced into England. They were a great improvement on the more ancient speculum metal mirrors, whose reflecting surfaces were liable to oxidation from exposure to the air, but they have the disadvantage that there are two reflecting surfaces, one of glass, the other of metal. Polished metals reflect nearly all rays of light at all incidences; glass reflects very few rays at the normal incidence, but the amount of reflection becomes greater and greater as the incidence becomes more and more oblique. Mirrors are usually either «plane» or «spherical.» Spherical mirrors are small portions of the surface of a sphere. In a spherical mirror, concave or convex, the line through the centre of the spherical surface of which the mirror is a part and the middle point of the mirror is called «the axis.» From a concave mirror rays parallel to the axis converge after reflection to a point called the «principal focus,» which is half-way between the centre of the sphere and the mirror. (See LIGHT). Rays from a luminous object outside the spherical centre of a concave mirror form a small, real, inverted image of the object between the centre and the principal focus; when the object is between the centre and the principal focus the image is beyond the centre, and is large, real and inverted.

Prior to 1835 mirrors were almost universally made by applying a coat of tin-foil amalgamated with mercury to the surface of plate-glass. In 1835 Baron Liebig observed that on heating aldehyde with an ammoniacal solution of nitrate of silver in a glass vessel, a brilliant deposit of metallic silver was formed on the surface of the glass. To this observation the more recent process of silvering glass is really due. In 1849 Drayton made known a method in which he employed as a backing composition two ounces of nitrate of silver, one ounce of ammonia, three ounces of alcohol and three ounces of water. The defects of these two modern processes are that the deposit of silver on glass is not so adherent and unalterable under the influence of sunlight and sulphurous fumes as the old amalgam of tin and mercury; besides, the newer processes give the glass a slightly yellowish tinge. These disadvantages have been obviated by applying to the silver coating a weak solution of cyanide of mercury, which immediately forms a kind of amalgam and renders the deposit at once much whiter and more adherent. The silvering is protected from mechanical abrasion and the chemical action of gases and vapors by a coating of shellac or copal varnish, which when dry may receive a further covering of red-lead paint. A method of coating glass with platinum has been recently introduced. A solution of bichloride of platinum is spread over the surface of the glass with a fine brush, and the metal is precipitated with oil of lavender. As this summary process produces a somewhat gray lustre it is used only for cheap mirrors, the lids of ornamental boxes, toys and the like.

MIRROR CARP. See CARP.

MIRROR OF KNIGHTHOOD, The, Spanish romance of chivalry. It was one of the books in Don Quixote's library and of it the priest said to the barber: «In this same ‹Mirror of Knighthood› we met with Rinaldo de Montalban and his companions, with the Twelve Peers of France and Turpin the historian. These gentlemen we will condemn only to perpetual exile, as they contain something of the famous Bojardo's invention, whence the Christian poet Ariosto borrowed the groundwork of his ingenious compositions; to whom I should pay little regard if he had not written in his own language (Italian).» ‹The Mirror of Knighthood› is identified with the ‹Cavallero del Febo› (Knight of the Sun), a romance belonging to the Amadis de Gaul Cycle. It seems to have been the work of several hands and was unfinished. An English translation was printed in 1578.

MIRROR FOR MAGISTRATES, The. This once popular work, the first part of which was published in 1555, and the last in 1620, was the result of the labors of at least 16 persons, the youngest of whom was not born when the oldest died. It probably owed its inception to George Ferrers, master of the king's revels at the close of the reign of Henry VIII; and he associated with himself William Baldwin. Richard Niccols is responsible for the book in its final state; and in the interim, it was contributed to by Thomas Newton, John Higgins, Thomas Blennerhasset, Thomas Chaloner, Thomas Sackville (who wrote the poetical preface called the Induction and the life of Buckingham), Master Cavyll, Thomas Phaer, John Skelton, John Dolman, Francis Segar, Francis Wingley, Thomas Churchyard and Michael Drayton. It is a «true Chronicle Historie of the untimely falles of such unfortunate princes and men of note, as have happened since the first entrance of Brute into this Iland, until this our latter age.» It was patterned after Lydgate's ‹Fall of Princes,› a version of Boccaccio's poems on the calamities of illustrious men, which had been very popular in England. The stories are told in rhyme, each author taking upon himself the character of the «miserable person» represented, and speaking in the first person. The first one told by Ferrers is that of Robert Tresilian, chief justice of England.

MIRROR OF PERFECTION, The, is a most intimate and exceedingly illuminating account of the son of Peter Bernardone, cloth merchant of Assisi. Christened John he was nicknamed by his father «Francisco» and is known to the world by no other name than that of Saint Francis of Assisi.

The volume, small enough to be attractive — there are only about 50,000 words to it — was written by Leo of Assisi who is often spoken of as the «beloved disciple» of Saint Francis. «Brother Leo, was not merely a fellow-townsman, ‹companion,› disciple, and dear friend of Francis of Assisi. He was also his sick-nurse, secretary and confessor during the last six years of his life. None knew Francis so intimately, or remembered him so well. None could be more scrupulously conscientious in recording what he believed to be the exact truth about the not yet canonized Saint.» The character and fashion of the record tempts one to speak of him as Saint Francis's Boswell. It is the «oldest life of the Beloved Francis,» being «done,» so a note at the end of the volume informs us, «in the most holy place of S. Mary of the Little Portion, and completed this fifth of the Ides of May in the year of Our Lord 1228.» Saint Francis died 3 Oct. 1226.

The significance of the title is disclosed in these words of the author: «Here endeth the Mirror of Perfection of a brother Minor; to wit, of the Blessed Francis, wherein we may most sufficiently behold as in a glass the perfection of his calling and profession.» Without a doubt a less scrupulous writer would have said also the perfection of the life of the Blessed Francis. He refrained from saying this most likely because he knew that Saint Francis would most flatly resent being spoken of as perfect.

The style in which the book is written is singularly in keeping with the spirit and character of the subject, and of the type of life he represented — simple, direct, homely, shorn of all scholarly vanities and conceits as the life of the subject was shorn of all wordly comforts. There is an indescribable charm and power of revelation to this narrative that is simple and homely even almost to the point of bluntness. Narrative is hardly the correct word. Perhaps it is better described as «a chaplet of immortelles set upon the head of the Saint on the morrow of his death to typify the crown of glory achieved by this beatified Spirit.»

It is hardly a disinterested picture or biography. Some of it has been written with a distinct purpose, the intent being to show not merely what kind of a man Saint Francis was and the kind of life he lived but what principles and «Rules» he laid down as the foundation of the famous Order which takes its name from him, and it is plainly also the purpose to show what obedience to these principles is the true path of the perfect Christian. Sometimes Brother Leo becomes controversial, taking vigorous issue with those, and they were many, who «desired to ignore certain of the wishes and to modify certain of the injunctions of Francis in what they believed to be the interests of the Order.» All this however does not lessen the value of the book as a carefully drawn and wholly reliable picture of the founder of the order of Franciscans. By his scheme of minutely, yet briefly, telling what Saint Francis did on those occasions when it seemed best that by example he should make clear to those concerned what doctrines he believed should govern their conduct, and of repeating what reply was made to those who came to Saint Francis seeking information or to question his ideals, the author gives the reader a very impressive picture of this noted religious character. With the devotion of one who is wholly of the same mind and spirit as the subject of his writing Brother Leo with painstaking accuracy repeats in «what wise the Blessed Francis declared the will and intention which he had from the beginning to the end as regards the observance of poverty» and of «maintaining poverty in books, and beds, buildings and appliances,» and «how he did induce and teach his brethren to go forth for alms,» thus disclosing what manner of man he was. He recounts instances showing with what unswerving zeal Saint Francis carried out to the very limit of perfect example his ideals of absolute poverty in all things, of humility, charity, compassion and condescension. There may be much more to the life of the Blessed Francis than is here given, but the author has without doubt in these pages pictured Francis in the fashion in which he most desired to appear before his fellow-men. It is a book one must read if he would know the real Saint Francis and appreciate the ideas and ideals which moved him to fashion his life after the manner of the rules he made for the order that grew up about him.

Rev. CHARLES GRAVES.

MIRYACHIT, mēr-yä'chĭt, a peculiar nervous disease prevalent in Siberia and some other countries, the chief characteristic of which is mimicry by the patient of everything said or done by another person.

MIRZA, mėr'zą, Persian title, equivalent to «Prince.»

MIRZA, Husain Ali Nuri, Persian religious reformer: b. Mazadran, Persia, 12 Nov. 1817; d. Akka, 28 May 1892. He was of noble family, joined the Bahai movement in 1850 and was imprisoned during the fierce political and religious persecutions which the sect suffered shortly after the death of Mirza Ali Mohammed. (See BAHAISM). His property was confiscated and he himself, with his family, was banished from Persia to Bagdad (Turkey) in 1852. Many Bahais followed him, most of them fleeing from the fierce persecution at home. Mirza Ali organized these into a compact, well-governed and self-sustaining community which soon became wonderfully prosperous, growing steadily in wealth and numbers. He was early looked upon as the great leader foretold by the founder of the faith; and new adherents came from all over Asia to study under him or to join the colony in Bagdad. This prosperity of the colony and the popularity of Mirza Ali, the «Bab» (gate or door), excited the jealousy of the Persian government and church, and the prophet and the whole colony were extradited and brought back to Constantinople. During the exodus, Mirza Ali proclaimed himself the expected prophet and took the name of «Baha'o'llah» (the Glory of God), by which designation he has ever since been known among his followers (1864). As the Bahai movement continued to grow with great rapidity in Constantinople, Mirza Ali was banished to Adrianople. Thousands of the faithful followed him there and he was removed to Akka (Palestine), a Turkish penal settlement, with 70 of his most active disciples (1868). They were all subject to the most rigorous imprisonment and treated with great harshness for seven years. At the expiration of this time the Bahais were allowed to form settlements in the town of Akka. To these settlements came people of all sects and creeds, and the penal colony became the centre of an intense religious movement which proclaimed the brotherhood of man, the unity of the race and the identity of all true spiritual aims and thought. There Mirza Ali remained from 1868 to 1892, writing his doctrinal books, working out plans for the government of the society and studying moral, social, political and economical questions and applying the lessons thus learned to the illustration of the gospel of the unity of mankind, of religion, of society and of government. He boldly attacked the problems of the day and attempted to solve them through the application of his own religious views. Among the works of Mirza Ali are 'The Hidden Words'; 'The Most Holy Book'; 'The Book of Certainty' and The Seven Valleys.' See BAHAISM; ABDUL BAHA.

MIRZAPUR, mēr-zä-poor', India, a city and district of the Benares division of the United Provinces. Mirzapur, signifying the Prince's Town, the capital of the district, is on the right bank of the Ganges, 56 miles by rail southeast of Allahabad and 509 from Calcutta. It presents an imposing appearance from the river, with fine ghats leading down to it, and numerous mosques, temples and handsome European houses occupying some of the most conspicuous sites, but the interior is disappointing. It has the largest mart in Upper India for grain, cotton and other raw produce, but with the railway era and the rise of Cawnpore to commercial importance, much of its trade has migrated elsewhere. Shellac, brassware and carpets are manufactured. There are imports of grain, sugar, cloth, metals, fruit, spices, tobacco, lac, salt and cotton; and exports of the same articles with manufactured lac-dye, shellac and ghee butter. Pop. 32,232. The district has an area of 5,238 square miles, and a population of about 1,100,000, chiefly Hindus. The chief products are wheat, barley, cotton, oil-seeds and fruits.

MISAMIS, mē-sä'mĭs, Philippines, a province of the island of Mindanao, situated on the north central coast, bounded on the east by Surigao; area, 3,406 square miles, with dependent islands, 3,521 square miles. The province is crossed by two mountain ranges, one on the east side with three summits of over 5,000 feet elevation, and the other on the west side with a peak that rises 8,560 feet. It has a number of rivers, and is crossed by the Grande de Mindanao, or Pulangui, which rises in the northeast; Lake Lano also extends over the southern boundary within its limits. The staple agricultural products are hemp, chocolate, coffee, cotton, sugar, rice, tobacco, corn and sweet potatoes; the forests contain woods valuable for building as well as resinous trees. The chief industry is the manufacture of fabrics used for dress for home consumption and sacks for packing purposes. There are no good roads of any importance; the inland towns and villages are reached by river or trail, and the trade between coast towns is by native craft. The population is mostly Visayan, with some Moros in the western part. Pop. 175,683.

MISANTHROPE, Le, lĕ mē'zäṅ'trōp', a comedy of Molière in five acts in verse, presented for the first time in the Theatre of the Palais-Royal, 4 June 1666, when the author was 44 years old. Molière played the title-rôle and his wife the part of Célimène. This play, which is Molière's nearest approach to tragedy, concerns one Alceste, who rails at the insincerity of mankind and yet is in love with a coquette, Célimène — a stroke which art is incapable of without genius. Alceste excites at once our admiration, pity and laughter. An upright and sincere man even to an unreasonable degree, he is made miserable by a letter of Célimène which seems to justify his righteous indignation. Notwithstanding that these fears seem to be well founded, Alceste remains in love with Célimène, but wishes her to withdraw with him from human society — which she of course refuses to do. The splendid emptiness of the life in a Parisian salon of the 17th century is placed vividly before us. There is no place for a natural and honest character in such society. Everything is artificial, deceptive and shallow. Molière's own experience had been so painful that the accent of truth pervades his treatment of the character which so nearly resembled his own. His life, saddened by hostile criticism, ill-health and an unhappy marriage, had become embittered, and some have attempted to prove therefrom that Molière himself is the real Alceste. It is true that he revealed more of his real self in this play than in any of his other plays, but he was too much of an artist to depict merely his own character. His unhappy domestic life probably did influence him to some extent, but the germ of the play is to be found in his earlier but unsuccessful play, 'Dom Garcie de Navarre' (4 Feb. 1661), from which he borrowed freely both scenes and verses The Duke de Montausier, the character of Mégabate in Mlle. de Scudéri's 'Le Grand Cyrus' and Boileau may also have been, as has been claimed, in Molière's mind in his delineation of Alceste. As a foil for the rigorous Alceste, the author presents us with the indulgent Philinte, who bears with men's faults from the necessity of living among them. So likewise with the coquette is contrasted the virtuous Éliante. The prude Arsinoë, and the marquis, typical of the large class of nobility whom Molière suspected of using their influence at court against him, constitute the other principal characters. Sheridan has imitated a scene of 'Le Misanthrope' in his 'School for Scandal' and Wycherly has imitated the entire play in his 'Plain Dealer,' but in a comparison between the imitation and the original the difference is seen between genius and brutality. The idea behind 'Le Misanthrope' may perhaps be best rendered in the words of Philinte: «All these human defects give us opportunity in life of exercising our philosophy. 'Tis the most amiable employment virtue finds; and if every place were full of honesty and all hearts were frank, just and docile, the greatest part of our virtues would be useless to us, since the use of them is placed in this, in the power of bearing the injustice of another in respect to our property, without being ruffled.» From this it is evident that Molière in his characterization does not discredit virtue, as such critics as Rousseau and Fénelon claimed, but merely the austerity of virtue not tolerant enough of human weakness. The public of the time was not prepared for such a fine distinction and did not appreciate the humor which reigns throughout. Consequently, in spite of its purity and elegance of style, the play was coldly received. It is said that at the first presentation, after the reading of Oronte's sonnet, the pit applauded, but Alceste afterward in the same scene contended that the sonnet was mere trash, whereupon the audience, through embarrassment at having approved it, became prejudiced against the entire play. Subsequently, it has become to be almost universally acknowledged as the most perfect piece of French comedy and the masterpiece of

Molière. There is an extremely clever translation of ‹Le Misanthrope,› with the French text *en regard,* in the fourth volume of the works of Molière published by John Watts (London 1748).

Herbert F. Wright.

MISCARRIAGE, literally a failure, a going astray. I. A miscarriage of justice is a failure of the law to attain its ends; or a breach of legal duty. Such is the significance of the term as employed in the fourth section of the English Statute of Frauds and in similar statutory provisions in the United States. II. Miscarriage in medical jurisprudence is employed in the sense of abortion (q.v.).

MISCEGENATION, from the Latin *miscere,* to mix, and *genus,* race, a mixture of races. The word is usually applied to the amalgamation of the white and negro races in America, and came into general use toward the middle of the 19th century, when certain publicists advocated absorption of the blacks by intermarriage with the white race. Consult Davenport, C. B., ‹Heredity of Skin Color in Negro-White Crosses› (Washington 1913). See Mixed Races.

MISCHIANZA, mĭs-kẹ-än'tsạ, **The,** in American history, an entertainment given in Philadelphia, 18 May 1778, during the war of the Revolution, by officers of the British army, in honor of Sir William Howe, about to return to England after his supercession. The entertainment was given at the country home of Thomas Wharton and comprised a dinner, dancing, a regatta, mock tournaments and various games. Major André was prominent in planning the entertainment. Consult Sargeant's ‹Life of Major André› (New York 1902).

MISDEMEANOR, *in law,* any offense below felony; the least offense by English common law: In the United States, the different States vary widely in defining misdemeanor, so that what is misdemeanor in one State may be indictable felony in another. Among the offenses commonly classed under this heading are malicious mischief, assault and battery, etc.; criminal proceeding on such charges may be dropped, in many States, if the injured party acknowledge satisfaction, which suggests a distinction between felony. The historic line between the two classes of offenses was based on the outcome of conviction; in the case of felony the convicted person forfeited his property, real and personal, if the felony was capital, personal only if the felony was not capital. But no forfeiture of property ensued upon conviction for misdemeanor.

MISE OF AMIENS, mēz, ov ạ'mē'äṅ', (*mise;* Anglo-French term meaning judgment, from the French *mettre,* to place), is the name given to the decision of Louis IX of France in the controversy between Henry III of England and his barons (23 Jan. 1264). Henry went in person to Amiens to attend the arbitration; but an accident prevented Simon de Montfort from doing the same. Louis had his idea of the dignity of royalty and was too scrupulous not to credit another king with a desire of doing his duty. He, therefore, decided all points in favor of Henry and annulled the Provisions of Oxford and all engagements founded upon them, leaving Henry a free hand to appoint his ministers and to enjoy his royal power as fully as he had done before the enactment of the Provisions of Oxford. See Montfort, Simon de; Henry III; Barons' War.

MISE OF LEWES, lū'ĭs, a treaty made by Henry III after the battle of Lewes (14 May 1264), where he was defeated and captured by the Barons under Simon de Montfort. The Mise of Lewes contained seven articles. By the first and second, after a reconformation of the Provisions, a new body of arbitrators was named — the archbishop of Rouen, the bishop of London, Peter, the chamberlain of France, and the new legate the cardinal bishop of Sabina, with the Duke of Burgundy or Count of Anjou as umpire when necessary; the third directs that the arbitrators shall swear to choose only English counsellors; by the fourth the king is bound to act on the advice of his counsellor in administrating justice and choosing ministers, to observe the charters and to live at moderate expense; by the fifth Edward and his cousin Henry are given as hostages; by the sixth is provided the indemnity of the earls of Leicester and Gloucester, and the seventh fixes the next Easter as the time for the completion of the compromise. Peace was declared on 25 May and published at London on the 11th of June. See Henry III; Montfort, Simon de; Barons' War.

MISENO, mē-sā'nō, **Cape,** Italy, a promontory forming the west side of the Bay of Pozzuoli (ancient Cumæ), 10 miles southwest of Naples. On it are the ruins of the ancient city of Misenum, destroyed by the Saracens, 890 A.D., which Augustus made one of the principal naval stations of the Romans.

MISÉRABLES, Les, lā mē'zạ'rạ'bl, by Victor Hugo, is by universal consent one of the great novels of the world. Heralded since 1854 as designed to be a sort of social gospel, written almost wholly in exile by one whose political intransigence had attracted general regard, the work, extending to 10 volumes, appeared simultaneously in as many languages (3 April to 30 June 1862) and has since been in constant and wide circulation in many lands. It was Hugo's first novel since ‹Notre-Dame,› 31 years before. That had been an evocation of the past. Here his eyes were on the present, his heart in the future. To profound compassion for the sufferings of the unfortunate he joined a sturdy faith in the possibilities of moral regeneration and social reform through a realizing sense of human brotherhood. «So long,» he says, in a preface, «as there shall exist, through the fault of our laws and customs, a social condemnation that creates artificial hells in the midst of our civilization and complicates a divine destiny by human fatalism; so long as the three problems of the century,— the degradation of man by the proletariat, the fall of woman by hunger, the arrested development of the child by ignorance,— are not solved; so long as social asphyxia is possible in any place — in other words and in a wider aspect, so long as there shall be on earth ignorance and misery, books like this cannot be useless.» The first of the three problems is here impersonated in Jean Valjean, the second in Fantine, the third in her unfathered daughter, Cosette.

In structure ‹Les Misérables› is loose-jointed, discursive, straying too readily into bypaths of antiquarian lore, political reminiscence, philological speculation, scientific conjecture, sociological visions. Hugo is apt to proclaim some commonplace with oratorical emphasis, as though it were a revelation of social salvation. He is apt to overcharge his characters till they become hardly human embodiments of some abstract quality, it may be mercy and forgiveness as in Bishop Myriel, untempered social justice as in Javert, political intransigence as in Enjolras, unmitigated cunning and cruel greed as in Thérnadier. But through all there is a sincere and intense if vague emotion, a deep pulsing sympathy, a splendid indignation at the ignoble and base degradations of outworn institutions and conventions, an unfailing force of moral conviction, a glowing eloquence, that make it easy to pass by, if not to forget, the occasional cyclopean lack of humor and the passages of puerile insipidity that are in strange contrast to others of impassioned and beautiful lyric appeal.

Hugo is a social optimist, often grand, never petty, though sometimes grandiose. Its foibles apart, ‹Les Misérables› is a noble plea for more practical recognition of the brotherhood of man, for more charity in judging the tempted, the wretched and the fallen. Jean Valjean, whose struggle for social reintegration is the connecting thread of the 10 volumes, is a discharged convict contending against social and legal proscriptions that must have driven him back to the galleys whence he came, had not Bishop Myriel redeemed him with the gift of the silver which he had stolen. He makes himself respected and beloved. But a petty theft remains unexpiated, and rather than see another suffer on account of it he surrenders himself again to prison. But first he lightens the last hours of Fantine, once a symbol of joy, «innocence floating on error,» now the dying mother of Cosette, whom she has in desperation consigned to the mercies of Thérnadier and now commits to the heart of Valjean. Here ends «Fantine,» the first of the novel's five parts, to be remembered especially for Bishop Myriel, said to be essentially Monsignor de Miollis, a former bishop of Digne. The second part, «Cosette,» opens with a justly famed picture of Waterloo, whence the scoundrel camp-follower Thérnadier, a plunderer of corpses, had saved for his own base ends Colonel Pontmercy, father of Marius, the romantically predestined husband of Cosette, and apparently reminiscent of Hugo's own. Then it tells of Valjean's life in the galleys and of his escape, how he was pursued by justice incarnate in Javert, how he rescued Cosette from Thérnadier and himself found refuge as a convent gardener, with reminiscences of Hugo's own childhood at Les Feuillantines. «Marius,» the third part, is concerned mainly with the restless political agitation among those dissatisfied with the results of the Revolution of 1830. Marius is what Hugo thought he himself might have been. The charm of this part is in the very genial account of the Parisian *gamin*, Gavroche. Part 4, «Saint Denis,» has a brilliant account of the great barricade and riot of 5 June 1832, with the touching death of Gavroche and the first buddings of the love of Marius and Cosette. «Jean Valjean,» the fifth part, is especially notable for its account of the rescue of the wounded Marius by Valjean and their passage through the sewers, of the despairing suicide of the baffled Javert, of Thérnadier's unintentional enlightenment of Marius as to his real debt to Valjean and for the very beautiful picture of the redeemed convict's august end.

‹Les Misérables› has been abridged by O. B. Super (Boston 1903), and well translated by C. E. Wilbour (‹Everyman's Library,› 1909) and others. Consult Biré, ‹V. Hugo après 1852› (Vol. I, pp. 126–153), and, for summarized contemporary criticism, Bersaucourt, ‹Les Pamphlets contre V. Hugo› (pp. 227–279, 1912).

MISERERE, mĭz-ę-rē′rē (Latin, «have mercy»), the name (taken from its first word) by which the 50th psalm in the Vulgate (or Latin version) is known, corresponding to the 51st of the authorized version. It is the fourth of the seven Penitential Psalms. The *Miserere* forms part of certain liturgies, and various great composers have taken it as a subject. The *Miserere* of Allegri is particularly famous.

The name Miserere is also given to a projection on the underside of the seats of the stalls of mediæval churches and chapels. They are usually ornamented with carved work, and are so shaped that when the seats proper are folded up they afford a small seat at a higher level sufficient to afford some support to a person resting upon it, and were thus used by priests suffering from bodily infirmity.

MISERICORDIA, or **MISERICORDE,** a narrow-bladed Italian dagger used in giving the *coup de grâce* or finishing stroke to a wounded foe. Also the name of a society in Florence, founded in the 13th century, who tend the poor sick, carry victims of accidents or disease to the hospitals and the dead to their burial.

MISFEASANCE, mĭs′fē-zănc′, from the French *méfaire,* to do wrong, signifies the doing of a lawful act in a negligent, or improper, manner. Misfeasance is, in some cases, punishable by law. It should be contrasted with malfeasance, the doing of a wrongful act, and non-feasance, the failure to perform a promised act.

MISHAWAKA, mĭsh′ạ-wâ′kạ, Ind., city in Saint Joseph County, four miles east of South Bend, on the Saint Joseph River and on the Grand Trunk and the Lake Shore and Michigan Southern railroads. It takes its name from an Indian village formerly on this site, was settled in 1828 and was chartered as a city in 1899. Saint Joseph Iron Works, laid out on the south side of the river in 1835, was made a village in 1839; Indiana City was laid out on the north side in 1836; and these two towns were combined and incorporated as the town of Mishawaka, in 1839. Two miles up the river is the Hen Island dam which, with the Mishawaka dam nearer the city, supply Mishawaka with water power for many factories. The products include automobiles, wagons, plows, farm implements, machine-shop and foundry products, pipe organs, rubber boots and shoes, furniture, beer, pulleys, ladders, cement blocks, iron beds, aluminum castings, curtain stretchers, pearl buttons, felt shoes and slippers, cigars and leather goods. The city owns three fine parks, a public library, high school, hospital and orphans' home and an electric-light plant. Three bridges cross the Saint Joseph River at this point. In the surrounding country corn, wheat, oats, rye and peppermint are produced. Pop. (1920) 15,195.

MISHNA, mĭsh'nạ, the first part or text of the Talmud, the second part or Gamara (supplement) consisting of a commentary on or elucidation of the Mishna, which consists of oral traditions and glosses on the Pentateuch, made in Galilee by the Rabbi Jehudah or Judah Hakkodesh, who completed the work 220 A.D. A commentary was rendered necessary by the extreme terseness and conciseness of style with which the Mishna is composed. It is written in Hebrew, but it contains a number of Greek, Latin and Aramaic words, which had become naturalized in the Hebrew, and bears traces also of Aramaic idiom. The traditions set down in the Mishna were held by the Pharisees to be of equal authority with the written law of Moses, and were supposed to constitute an oral law delivered to Moses by God and by Moses delivered to Joshua, by Joshua to the elders, by the elders to the prophets and by the prophets to the men of the Great Synagogue. Such is the statement of the Mishna itself, which the Pharisees accepted. The Sadducees, however, rejected this doctrine, although in many cases they followed in practice «the traditions of the elders» with much fidelity. See Jews and Judaism — *The Talmud*.

MISIONES, mē-sē-ō'nĕs, Argentine Republic, a territory bounded on the north, east and south by Brazil, on the east by the rivers San Antonio and Pepiri or Pepiri-Gauzu, separating it from Brazil, and on the west by the province of Corrientes and Paraguay. Area, 11,511 square miles. Three low mountain chains radiate from the centre, and the greater portion of the surface is covered with forest, producing building and dye-woods, oranges, medicinal herbs and the *yerba maté* or Paraguay tea. The country is well watered and fertile, and there are valuable granite quarries. The Iguezu Falls, 196 to 200 feet in height, are more than twice as broad as Niagara. Maize is largely grown and sugarcane to some extent, and several sugar-mills are in operation. There are interesting and other ecclesiastical remains of the early Jesuit missions. Posadas, the capital, on the Parana, was founded in 1865. The territory had a population of about 53,563. A railway is projected to run through the centre of the territory.

MISKOA (from Greek, meaning hair-foot), an order of the Chætopoda, fossil marine worms (*Annelida*), discovered by Walcott in the Middle Cambrian rocks of British Columbia at Misko Pass, whence their name.

MISKOLCZ, mĭsh'kōlts, Hungary, capital of the comitat of Borsod, 24 miles northeast of Erlau. The inhabitants are chiefly employed in the cultivation of cereals and the vine, and there is an important trade in wine, corn, leather, stone, etc. Among the churches is a Gothic one of the 13th century, and it has also a fine hospital, several gymnasia and other educational institutions and a theatre. Pop. about 51,459.

MISNOMER (from the French *ménomer*, misnaming), an error in naming a person in a pleading, deed or other written instrument. See Plea and Pleading.

MISPICKEL. See Arsenopyrite.

MISPRISION, (1) the concealment of a crime, as felony or treason; called also *negative misprision*. (2) High misdemeanor or contempt, as maladministration by a public official or inducing a witness to refuse to testify; called also *positive misprision*. Misprision of felony is still punishable in the English law, but is practically obsolete elsewhere. Misprision of treason was formerly punished in England by forfeiture of goods and imprisonment for life, but to-day the maximum penalty is penal servitude for life. In the United States it is a Federal offense, punishable by imprisonment not to exceed seven years and a fine not to exceed $1,000.

MISREPRESENTATION, *in law*, any act, whether verbal or tacit, tending to create or creating a false impression on another, such that by acting upon this impression he is injured. Misrepresentation falls under two heads, deliberate and unwitting. Deliberate misrepresentation is either deceit or fraud. Unwitting misrepresentation is legal mistake, and its treatment by the law depends largely on circumstances, but is unfortunately too much influenced by the principle that «ignorance does not excuse,» which should strictly be confined to the application suggested by its original form, «ignorance of the law.»

MISRULE, Lord of, a whimsical title given to the leader of the Christmas revels in the Middle Ages. He is a descendant of the king of the ancient Roman Saturnalia who impersonated Saturn. His duties were to lead the multifarious revels of the season; or, in other words, to act as master of ceremonies. Stow in his ‹Survey› gives the following account of him: «In the feast of Christmas there was in the kings' house, wheresoever he lodged a Lord of Misrule or Master of Merry Disports, and the like had ye in the house of every nobleman of honor or good worship. The mayor of London and the sheriffs had their several Lords of Misrule ever contending without quarrel or offence, who should make the rarest pastime to delight the beholders. These lords beginning their rule at Allhallows Eve continued the same till the morrow after Candlemas Day, in which space there were fine and subtle disguisings, masks and mummeries, with playing at cards for counters in every house, more for pastimes than for gain.»

In the University of Cambridge the functions of the Lord of Misrule were performed by one of the masters of arts who was regularly elected to superintend the annual reproduction of Latin plays by the students besides taking a general charge of their games and diversions during the Christmas season, and was styled the Imperator, or Præfectus Ludorum. A similar Master of Revels was chosen at Oxford. It seems to have been in the Inns of Court in London that the Lord of Misrule reigned with the greatest splendor, being surrounded with all the parade and ceremony of royalty, having his lord-keeper and treasurer, his guard of honor, and even his two chaplains, who preached before him on Sunday in the Temple church. On Twelfth Day he abdicated his sovereignty. In the year 1635 this mock representative of royalty expended in the exercise of his office about £2,000 from his own purse; and, at the end of his reign, he was knighted by Charles I at Whitehall. The office was regarded among the Templars as most honorable and was generally conferred on young gentlemen of good family. The Lord of Misrule was always costumed extravagantly and carried a fool's bauble as badge of office. A favorite form for his lordship to enter upon his duties was to absolve the company of all their wisdom, leaving them «just wise enough to make fools of themselves.» Fealty was sworn to the merry monarch and the reign of fun and folly began.

In Scotland this character was called the Abbot of Unreason; in France, he was the Abbé de Liesse and Abbas Stultorum — the Abbot, or Pope of Fools. Scott gives a description of one of these mock-ecclesiastics in ‹The Abbot.›

MISSAL (Latin *missale,* from *missa,* mass), the book which contains the prayers, rubrics, antiphons, etc., of the mass. It was formed by comprising in one volume the separate books formerly used in different parts of the service, namely the Oratorium, Lectionarium, Evangeliarium, Antiphonarium, the Canon, etc., for the convenience of the priest. Variations and corruptions in the course of time crept into the text of the Missal, and the Council of Trent suggested a revision of it. This was accordingly accomplished by order of Pius V (1570), who required the new Missal to be used by the whole Church, with the exception of those societies which for more than two centuries had followed another ritual. Subsequent revisions made under Pope Clement VIII (1604), Urban VIII (1634) and Leo XIII (1884, 1898) extended little beyond alterations of single expressions, and the addition of new masses, both obligatory and permissive, universal and local. In the ancient and mediæval Church there were missals in use, varying according to the various rites. Thus, in England, there were missals of the Sarum use, Hereford use, Lincoln use, Bangor use, etc. There are also missals of the Greek Church, the Church of the Maronites and other Christian bodies. The earliest printed missal is the ‹Missale per totius Anni Circulum More Ambrosiano compositum› (Milan 1475, folio), which was followed by the ‹Missale secundum Consuetudinem Romanæ Curiæ› (Rome 1475).

MISSI (Latin, meaning those sent), name given to officials sent on special errands by the Frankish kings. Their institution dates from Charles Martel and Pepin le bref; but Charlemagne made them a regular part of his administration. Under Charlemagne the *missi dominici* were most important. Into each district of the great empire were sent each year two *missi:* one a lay nobleman and the other an officer of the Church. It was their business to hold court, hear complaints, redress grievances and report all this to the emperor. By this means Charlemagne controlled the courts and centralized the government. The missi dominici disappeared from France and Germany in the 9th century and from Italy in the 10th century. Consult Thompson, J. W., ‹Decline of the Missi Dominici in Frankish Gaul› (Chicago 1903).

MISSING LINK, a term used to designate the gap in the scheme of evolution between the ape and man. See APE; EVOLUTION; DARWIN; PITHECANTHROPUS ERECTUS.

MISSION INDIANS, a general name given the Indians of southern California who in the 18th century were Christianized by the Spanish Franciscan missionaries. The Mission Indians were originally of many tribal families and dialects, but chief among them were the Yumas and the Shoshones. Father Junipero Serra (q.v.) and the other friars who followed him succeeded in gathering the Indians into communities, mission houses and chapels were built and vineyards planted. The work began about 1776 and continued successfully until 1831. In this latter year they numbered 19,000, but with the overthrow of the Spanish power by the Mexicans a period of confiscation and destruction began, which continued to 1840. The friars were banished, the mission abandoned and the Indians driven back to the deserts and the mountains. Under the American rule in California, both Indians and missions were neglected until after the Civil War, when, principally at the instigation of Helen Hunt Jackson (q.v.), the government took steps to care for the unfortunate natives. They now occupy about 30 small reservations, which in the aggregate contain 180,000 acres. The remaining Indians number about 2,600. They are partly civilized and fairly industrious. Within recent years an organization in Los Angeles has endeavored to rebuild the ruined missions and preserve them in remembrance of the historic past. (See PIOUS FUND). Consult Englehart, Z., ‹Missions and Missionaries of California› (San Francisco 1908); Wetmore, C. A., ‹Mission Indians of Southern California› (Washington 1895).

MISSION SOCIETY, American Baptist. See MISSIONS, PROTESTANT FOREIGN.

MISSIONARY RIDGE. See CHATTANOOGA, BATTLE OF.

MISSIONARY SOCIETY, Methodist. See METHODIST CHURCHES OF THE WORLD.

MISSIONS, Protestant Foreign. Foreign missions were not seriously undertaken by Protestants until more than 200 years after the Reformation. This curious fact is sufficiently explained by the circumstances that the reformers were involved at the outset in a struggle not only for liberty but for life itself; that Christendom did not yet control the whole of Europe; an aggressive Mohammedan power with its foot in Hungary and its fleets in the Mediterranean being still active in its purpose of conquest; and that the state alone commanded resources sufficient for enterprises of any kind in remote regions like the Indies, Africa or America. These circumstances of life in Europe in the 16th century materially lessen the importance of the question whether Luther and his followers did or did not see that a Christian Church must die which is not actively missionary in principle.

The first Protestant missions, perhaps naturally, were state enterprises, unless we reckon as a mission the single effort of Heiling (1634) in Abyssinia, which ended with his murder 20 years later. In 1556 the Council of Geneva sent missionaries to Brazil with Coligny's colony, who perished with the colonists. In 1635 the Duke of Gotha sent a mission to Persia, and in 1663 again a mission to Abyssinia; both unpractical embassies were quickly forgotten. The Dutch government, after gaining possession of the East Indian Archipelago in 1602, made a serious effort to Christianize the Malays, and the people of Ceylon and of Formosa, producing permanent results in Java and the adjacent islands of the East Indian Archipelago only. The Dutch government published in 1685 the New Testament in Malay (the second of modern translations of Scripture into heathen languages; Eliot's translation into Mohican in 1663 having been the first), and the whole Bible in 1701. It has also maintained a Malay Protestant Church in Java, the Moluccas and Celebes, which now has about 400 ministers and 250,000 adherents, of whom probably one-half are descendants of the 17th century converts. A similar state missionary enterprise undertaken by a Protestant government of Europe was the Danish mission to South India, founded by King Frederick IV of Denmark in 1706. The king sent out as the first missionaries to Tranquebar, Ziegenbalg and Plutschau, Germans from Francke's school at Halle. Other Germans from the same surroundings followed, notably Schultze and his later associate, Schwartz, making this Danish mission the first serious Protestant mission in India. Ziegenbalg translated the New Testament into Tamil (the third of modern translations of Scripture into heathen language), and before the end of the century from 30,000 to 50,000 Tamils had become Christians.

Another mission maintained by Frederick IV of Denmark was that commenced by Hans Egede in Greenland in 1721, and later transferred to the care of the Danish Missionary Society. This mission Christianized the whole Eskimo population in the vicinity of the Danish trading stations.

The British government showed a similar sense of responsibility for missionary work in its colonies, and the duty of preaching to the North American Indians was laid down in the charters of Virginia (1584) and Massachusetts (1628). Parliament even went so far as to consider in 1648 the endowment of a state foreign missionary enterprise. It voted a grant in aid of the «Society for the Propagation of the Gospel in New England,» formed in 1649 and still existing under the name of the New England Company, which educates Indians in Canada with the revenues of the ancient government grant. John Eliot of Roxbury, Thomas Mayhew of Martha's Vineyard, and others through this government solicitude received state support in their missionary work for Indians. The British East India Company, moreover, was required by its charter in 1698 to maintain chaplains at its stations, and to instruct its Hindu servants in Christian doctrine.

All of these state enterprises in the line of foreign Protestant missions were uncertain in method and precarious in stability. They served, at least, to show the possibility of prosecuting missions in the colonies, but were sufficiently barren to suggest the formation of those voluntary societies for missionary effort which proved to be the effective form in which the missionary idea among Protestants was to express itself.

Unsatisfactory religious conditions in the East India Company's trading posts led in 1698 to the organization of the «Society for the Promotion of Christian Knowledge,» with the purpose of providing books and schools for neglected English communities, and in 1701 to the appearance of the «Society for the Propagation of the Gospel in Foreign Parts,» intended to provide for the religious culture of Englishmen residing in foreign lands. Both of these societies were directed by the Church of England, although voluntary in form and in the sources of their revenues. Neither of them were foreign missionary societies. But the first now publishes books in Oriental languages, and it saved the Danish Mission in South India from dying with its royal founder, and supported it during a century, until it was taken over by the Society for the Propagation of the Gospel. This latter society, too, has gradually taken up the work of evangelizing pagans until it has (1915) 1,005 missionaries in India, China, Japan, Korea, Malaysia, Africa and the West Indies, with nearly 3,500 native clergy and laymen in the various departments of its work. These two societies then, founded about the beginning of the 18th century, may be considered as the pioneers of the voluntary foreign missionary societies of Protestant Christendom.

It was not until the 19th century was about to dawn, however, that a general movement toward missionary enterprises began among Protestants in Europe and America. This movement grew out of that revival of personal religion in the 18th century which was fostered by the writings of Spencer and Francke, the Pietists of Halle, and by the devoted lives of men like David Brainard of Connecticut, and Zinzendorf, the patron and leader of the Moravians, and was stimulated by the exhortations of Whitefield, the Wesleys and Jonathan Edwards, and by the example of the «Unity of Brethren» (*Unitas Fratrum* or *Brüder Unität*) as the Moravians call themselves. The Moravians, not as a church that begs men to volunteer, but as a community in which every member has equal interest in evangelism, were the first decided champions of Protestant missions. They held it the duty of all Christians to tell men what benefits they had received from Jesus Christ. They established missions between 1732 and 1770 in the West Indies, in Greenland, in the Indian settlements of North America, among the Hottentots of South Africa, and in Labrador. They (1913) support 359 missionaries and 2,157 native preachers and teachers in their various mission fields which include, besides those already named, Alaska, Australia and the border lands of Tibet. The English Wesleyans should also be reckoned with the Moravians as having taken up missions in advance of the general movement of the Protestant churches. They did not formally organize the Wesleyan Methodist Missionary Society until 1814. But in 1779 they employed missionaries among the North American Indians, and in 1786 they began an important work among the slaves of the West Indies. The Society has (1915) 807 missionaries, and

5,756 native workers and teachers in India, Ceylon, South Africa, China, Polynesia and the West Indies.

Before this extension of Wesleyan missions took place a surprising outburst of zeal for the missionary idea appeared almost simultaneously in England, in the United States and on the Continent of Europe. It was a revolution, since formalism had made the Protestant churches almost forget that to be a Christian means to be always in some sense a missionary. The characteristic feature of the movement was its origin in the conscientious convictions of isolated individuals, from whom the Church did not expect initiative and whom it sometimes regarded as unsteady enthusiasts. William Carey, a cobbler and a Baptist minister in England, made the first move in 1786 and was frowned down by his elders. But in 1792 his earnest conviction carried the day; 12 men united to form the Baptist Missionary Society (England), and Carey and Thomas went to India as its first missionaries. There is no space here to describe the marvelous activities of Carey and his associates Marshman, Ward and others, at the Danish trading post of Serampur near Calcutta, where they were given asylum when the East India Company refused to tolerate their presence in its territories. The great school buildings which these missionaries erected at Serampur stands to-day, and their press added to the then slender stock of Bible translations passably good versions of Scripture in 34 Oriental languages and dialects. The Baptist Missionary Society has (1915) 477 missionaries and 2,000 native preachers and teachers in India, Ceylon, China, Africa and the West Indies.

This example was contagious. In 1795 «The Missionary Society» was formed in London by the union of notable men of four different denominations. Its name was afterward changed to «The London Missionary Society.» It is (1915) substantially composed of Independents (Congregationalists) alone, and has 480 missionaries and 7,000 native preachers and teachers, in Polynesia, New Guinea, Madagascar, Africa, India and China. In 1796 two similar societies were formed in Scotland which at first aided the London Society, but later took up independent work in the West Indies and in South Africa, and finally (1824) became merged in the Church of Scotland Foreign Missionary Committee, of which a later (1843) offshoot was what has now become the Foreign Missionary Society of the United Free Church of Scotland. The Church of Scotland Foreign Missionary Committee now has 120 missionaries and 1,200 native workers, and the United Free Church has 541 missionaries and 5,093 native preachers and teachers in India, China, Africa, Arabia, the New Hebrides, Manchuria and the West Indies. The same impulse led in 1797 to the formation in Holland of the Netherlands Missionary Society. This was first an auxiliary of the London Missionary Society but soon undertook independent work. In 1913 it had 63 missionaries and 154 native workers in the Dutch East Indies.

The same conviction of responsibility together with realization of the extent and condition of the heathen world led in 1797 to the organization in London of 26 men belonging to the Church of England as the «Society for Missions to Africa and the East.» This name later gave place to the familiar one of the «Church Missionary Society.» Among its founders were William Wilberforce, Henry Venn and Charles Simeon; but the Church of England gave the Society no encouragement until the successes of nearly 50 years compelled recognition. Hence the first missionaries of this Society were commonly Germans; for the most part men of the highest ability and attainments. The fields of the Church Missionary Society are India, Ceylon, China, Japan, Africa, Mauritius, New Zealand, Persia, Palestine, Egypt, the Sudan and the Arctic regions of British North America. It has (1915) 1,369 missionaries and 11,181 native preachers and teachers.

Missionary enterprises next began to spring up in Germany and in America. The marked characteristic of the movement in every case was the same profound conviction of individuals, commonly not officials of the churches to which they belonged. Five students of Williams College in Massachusetts furnished the initiative that resulted in the organization of the «American Board of Commissioners for Foreign Missions» in 1810. This was at first an interdenominational society. Its first missionaries, Newell, Judson, Hall, Rice and Nott, were sent to India and were ordered out of the country by the East India Company the moment they landed. Judson and Rice took refuge with the English Baptists at Serampur, while the others succeeded in effecting a lodgment at Bombay and in Ceylon. The fields of this Society in 1915 were India, China, Japan, Ceylon, Africa, the Balkan States, Turkey, Austria, Spain, Mexico, the Philippines and Micronesia. Its missionaries number 656 and its native laborers 4,777. After 40 years of existence as an interdenominational society, it handed over its missions in Persia, Syria and the Gabun region of West Africa to the Presbyterians, and part of its field in South India to the American Reformed (Dutch) Church, and has become substantially a Congregationalist body. Judson and Rice of the earliest missionaries of this Society decided on arriving in India that they would prefer to serve under a Baptist organization and this decision led to the formation in 1814 of what is now the American Baptist Foreign Mission Society of Boston. Burma was the field selected for its first efforts and the heroic work of Adoniram Judson in that land made his name great among modern Protestant missionaries. The Society had in 1915 701 missionaries and 8,589 native laborers in Burma, Siam, Assam, India, China, Japan, the Philippines and Africa.

Meantime, in Germany, Jannicke of Berlin, whose brother was a missionary of the «Danish Halle» band in South India, opened a Missionary Training School at Berlin in 1800. This school during the next 25 years furnished about 80 missionaries to the service of the English and Dutch societies, and served to arouse interest in missions among the Germans. Its influence led in 1815 to the establishment of a Missionary Training Institute at Basel in German Switzerland. The latter institute furnished many admirable men to the service of other societies and in 1822 began to send out missionaries of its own. The fields of the Basel Missionary Society are in India, China and Africa, and graduates of its institute are pastors of Protestant churches in Turkey. In 1913 it had in the field about 475 missionaries and 624 native workers.

In 1824 10 strong men in the Lutheran Church, among whom were Neander and Tholuck, formed the Berlin Missionary Society; beginning operations, according to the wise continental practice, by opening a training school for missionaries. It began to send out missionaries in 1834 and now carries on missions in Africa and China. It had in 1913 about 150 missionaries (wives of missionaries not counted) and 1,000 native preachers and teachers. Other missionary societies sprang up in Germany during the first quarter of the 19th century. Of these the Rhenish Missionary Society is perhaps the largest. Its fields were in South Africa, China, Sumatra, Borneo and New Guinea. It has 382 missionaries and 1,340 native laborers. There are a score, at least, of other German missionary societies of which the chief are the Gossner Society, the Hermannsburg, the Leipzig, the North German and the Breklum societies, working in the Dutch East Indies, Africa, India, China, Australia and Turkey.

The same period saw the formation in France of the Paris Evangelical Missionary Society (1824), designed at first merely to aid existing enterprises, but quickly beginning to send out missionaries of its own. In 1913 it had 173 missionaries, men and women, and 1,274 native workers, in Madagascar, Senegambia and the Barotse and Basuto regions of Africa. With the development of French colonial expansion it has also taken the place of the London Missionary Society's missionaries in Tahiti and in parts of Madagascar, and of American missionaries in the French Kongo region. Protestant missionary societies in Holland, Denmark, Sweden, Norway and Finland sprang later from the same causes and are doing good work with 831 missionaries and about 4,000 native workers in Africa, India, China, Chinese Turkestan and Madagascar.

The same spiritual awakening of widespread effects gave rise also to the British and Foreign Bible Society (1804), the American Bible Society (1816), the Netherlands Bible Society, and Religious Tract Society of London (1799) and the American Tract Society of New York (1820). The Bible societies do true foreign missionary work in publishing the Scriptures as soon as missionaries have translated them into the languages of non-Christian peoples and in disseminating the Scriptures in these languages. Some 500 modern translations have been published. The British and Foreign Bible Society in 1915 employed about 2,000 colporteurs and Bible women and its total issues of Bibles, New Testaments and lesser parts of Scripture amounted to 11,059,617 copies. The American Bible Society has about 1,500 colporteurs in foreign mission fields and issued in 1915 7,150,911 copies. The Scottish National Bible Society issued in the same year over 2,500,000 copies, besides joining with the first named societies in providing finances for translating and publishing the Bible in various languages.

The tract societies aid missions in a similar manner; providing funds for the publication of undenominational Christian literature in the languages of non-Christian peoples. The Religious Tract Society of London at its centennial anniversary was able to report that it had given for this purpose to English and American foreign missions aid equivalent to $100 per day during the whole period of its existence.

In the second quarter of the 19th century the American Methodist Episcopal Church and the American Presbyterian Church began their missionary work in foreign lands. The two great branches of the Methodist Episcopal Church in 1915 had 1,199 missionaries and 10,800 native laborers. The Presbyterians North and South have 1,551 missionaries and 6,866 native laborers. Almost all denominations in the United States and in Great Britain now have foreign missionary organizations of their own. Interdenominational and international missionary societies, like the China Inland Mission, the North Africa Mission, the Christian and Missionary Alliance and other bodies of greater or less importance have been formed to carry on missionary enterprises by methods more free from machinery than the older societies sometimes seem to require. The total number of Protestant missionary societies now existing probably exceeds 500. The World War has interfered with collection of statistics, but in 1912 these societies reported 24,092 missionaries, men and women, and 111,862 native workers.

Four points are noteworthy, in the history of the development of these missionary societies, as each marking an epoch of expansion of their scope. These are: (1) The adoption of education as a missionary agency; (2) The general adoption by women of mission work for womankind; (3) The establishment of medical missions; (4) The opening of industrial departments in many missions.

1. Education.— The aim of foreign missions is to tell of Jesus Christ to those who do not know Him. The aim is to lead them to surrender self-will to the control of Jesus Christ so completely that converts shall be true Christians, who, if the missionary leaves to-morrow, will stand immovable in their devotion and their impulse to teach others the truth that has benefited themselves. At the outset the task seemed simple enough. To preach and preach again was all that was necessary. As a result of the first half century of experience, the discovery was made that common schools are essential in all missions which urge the reading of the Bible. Rev. Dr. Alexander Duff, a missionary from Scotland who left ineffaceable marks upon India, was a leader in championing the thesis that education in all grades is also an essential department of missionary effort. This principle is now established with all that it means of general enlightenment for backward races, and in 1912 there were in the Protestant missions throughout the world 35,000 educational establishments of all grades from kindergarten to university, attended by about 1,670,000 young people of every form of religious belief.

2. Woman's Work.— As early as 1825 missionaries undertook the education of girls in India, Africa, Turkey and elsewhere. In 1835 a Woman's Missionary Society was formed at Berlin, Germany, for the instruction of women in the East; and later schools for girls were opened in several non-Christian lands by different missionary societies. It was not until 1860 that the women of Christian lands began to take the matter into their own hands. Beginning with the Woman's Union Missionary Society of New York (1860), mission boards of women were organized in almost all the Protestant denominations of Great Britain, Canada and the United States. These missionary societies of women are for the most part closely allied to the general missionary boards of the denominations to which they belong, but they send out women as missionaries and have produced vast extension of the scope of the missionary enterprise. The impossibility of carrying on successful missions without women missionaries to win and instruct their own sex is now fully recognized. There were in 1912 about 2,968 unmarried women working as missionaries in all parts of the non-Christian world. No mission field is so dangerous or so repellent in its barbarism as to be denied the ministering service of devoted women of Christendom.

3. Medical Missions.— At the outset physicians were sent to the missions with the primary duty of caring for the health of missionaries. They could not, however. fail to use their knowledge for the relief of suffering in lands where surgery was unknown and the science of medicine parodied. It was not until about 1885 that the Medical Mission was fairly established as a recognized channel of missionary influence. Since that time the number of missionary physicians, both men and women, and of missionary hospitals and dispensaries has increased every year. In 1912 there were 800 men and women physicians and surgeons, with 1,638 hospitals and dispensaries in connection with foreign mission fields.

4. Results of Foreign Missions.— It used to be common for critics of missions to picture bewilderment among pagan hearers as a necessary result of denominational differences among missionary preachers. But the gospel preached to pagans by Protestant missionaries of different denominations is one in essence, and the problems of missionary effort in all fields are much alike. Sixty years ago missionaries of different denominations at work in India conferred together on the more efficient prosecution of the common work. The advantage of such conferences was so clear that the solidarity of the different missions may be set down as one result of the missionary enterprise. Conferences between the different missions are now held regularly in many foreign lands. Moreover general conferences of the societies of different nations have been held with notable advantage to the cause of missions. Such was the Conference of London in 1888, the Ecumenical Conference on Foreign Missions held in New York in 1900 and the World Foreign Missions Conference of Edinburgh in 1910. The Latin America Mission Conference of 1916 was a gathering of the same nature which brought together at Panama almost 500 missionaries and friends of missions from 21 nations. An annual assembly of the same class is the Foreign Missions Conference of the United States and Canada which brings together representatives of more than 40 missionary societies. Similar annual conferences are held in Great Britain and in Germany. Fruits of such gatherings are increase of sympathy and comity and diminution of possible causes of friction between different denominations and a steady advance in efficiency and economy on the foreign field. At home this unification of missionary interest has produced such interdenominational enterprises for the support of foreign missions as the Missionary Education Movement, the Student Volunteer Movement and the Laymen's Missionary Movement.

In 1912 the stations of foreign missionaries numbered 12,123 besides about 38,000 other places more or less regularly visited. The organized congregations were 15,396. In connection with these congregations the number of persons in full church membership was 2,644,170. Figures are proverbially uncertain agents for setting forth facts and their meaning. In any general statement such as is here attempted it should be remembered that before statistics can be gathered from the wide areas concerned many of the details will not be up to date. One thing that should be clear to the reader of this article, however, is the widening of the scope of foreign missions since the first fruition of the missionary idea in the modern Christian Church. This expansion of the scope of missions is not due to any modification of their fundamental purpose. It is due to experience of the needs of non-Christian peoples and especially of their need of a future nurture similar to that enjoyed by Christians at home. Let no one forget that no miraculous short cut exists by which a pagan savage can be transformed into a Christian gentleman of culture. The planting of the aspiration is a miracle but a majority of converts remain children in development. Some may use this fact to belittle the moral change seen in multitudes. The number of converts who do become leaders in the mission churches is not thus to be set aside. Men from the lowest classes have risen through devotion to Jesus Christ to the highest ability, like the slave-boy Crowther of Yorubaland and Constantian of Turkey who became eminent among Bible translators; or like Abdul Masih and Imaduddin of India, whose work among their own people as Christian ministers was that of masters of apologetics; or like Dr. Saleeby of the Philippine Islands, once a village boy in Mount Lebanon, whose fitness for good service was grounded on the instruction received in American mission schools in Syria. The clean and kindly lives of converts in the mission fields, their sincerity and stability influence their people. Of the 150,000 persons received into Church membership in foreign missions during 1912, it is not rash to estimate one-half as having been won to a serious study of Christianity by the subtle influence of the lives of Christian acquaintances. Furthermore the high qualities discovered in Christians often produce a gradual moral uplift among those who have not accepted the religious message of the missionary. It is a significant fact that in 1912 the missionary societies reported as income from the mission field $7,902,256. This money came in part, of course, from church collections, but a large part came from non-Christian patrons of mission schools and patients in mission hospitals. The Bible is widely circulated in mission fields. Some of the people decline to admit its authority as containing the principles of life on which must depend the stability of the universe; but they do regard it as a repository of experiences of men, wise and unwise, through many ages of time. These records sharply touch their own problems of life and character. In 1915 a Chinese official, not a Christian, bought in Peking several thousand copies of the New Testament in Chinese which he gave to friends and subordinates as containing the noblest scheme of moral conduct which the world has ever known.

Add to such by-products of foreign missions the direct fruits of missionary effort in endowing illiterate languages with alphabet and writings, in purifying literary thought and expression in languages which already have literature, in enlightening womankind, hitherto guarded against culture, in training children and youth, in teaching an industrial efficiency which touches the world's commercial interests, and one gains fuller comprehension of the results of foreign missions. This vast enterprise so reaches the source of social development among those masses with whom is the reserve vitality of every nation that it must be reckoned among the great agencies by which Europe and America are shaping the destinies of backward races throughout the world.

The outbreak of the Great War in 1914 created a reaction against Christianity throughout the mission fields of the world which prevailed until the East understood that the British Empire, and later the United States, were both fighting for justice and righteousness and for the rights of unprotected humanity. German foreign missions naturally suffered during the defeat of the nation which had violated the fundamental principle of Christianity, «Peace on Earth — God's will to men,» and the interdenominational, international missionary organizations which reached their culmination at the Edinburgh Missionary Conference in 1910 were, for the time, disorganized. The continuation committee there launched had been remarkably successful in binding under one organization the Protestant missionary forces of the world.

By the stand of the British Empire and America, North and South, a reaction occurred which increased the endeavors of Protestant foreign mission work as shown in the statistics presented at the Foreign Mission Conference of North America at Garden City, N. Y., in 1918. Gratifying increase was shown along all lines of foreign missionary endeavor and was best exemplified by the grand total of the incomes of the affiliated societies, representing as far as it was possible to be ascertained the amount given in Canada and the United States for carrying on foreign Protestant missionary enterprise. Of the total amount, $18,500,000 were given by living donors, a balance of nearly $2,000,000 representing the incomes from legacies, endowments and other sources. Exclusive of the income of the societies derived from the mission fields themselves, the total income amounted to $20,400,000 as compared to $16,939,741 in 1915 and $11,946,218 in 1910. Officially advanced by the National Missionary Society of Sweden in a communication to Secretary James L. Barton, chairman of the American National Committee, representing the mission societies of North America, the suggestion is to be acted upon, although many difficulties appear in the way of the achievement: «Whether plans should not be inaugurated by the Protestant missionary bodies of the world to put all foreign work upon a supernational basis so that in case of any future war, no matter what countries were involved, their institutions and their work should remain absolutely undisturbed?»

Bibliography.— The literature of foreign missions is enormous. Only a few standard works can here be suggested. Dr. S. M. Jackson's ‹Bibliography of Foreign Missions› (1891) may well be consulted. *General Surveys and Statistics:* Warneck, ‹Outlines of a History of Protestant Missions› (1907); Dennis, ‹Centennial Survey of Foreign Missions› (1902); ‹World Atlas of Christian Missions,› Student Volunteer Movement (1917); Bliss, E. M., ‹Encyclopedia of Missions› (2 vols., 1891); Dwight, Bliss and Tupper, ‹New Encyclopedia of Missions› (1904); Dwight, H. O., ‹The Blue Book of Missions› (1907); Barnes, L. C., ‹Two Thousand Years of Missions before Carey› (1901). *Missionary Societies:* Lovett, R., ‹History of the London Missionary Society› (2 vols., 1895); Stock, E., ‹History of the Church Missionary Society› (3 vols., 1899); Hamilton, L. T., ‹Moravian Missions› (1901); Pascoe, C. F., ‹Two Hundred Years of the Society for the Propagation of the Gospel› (1901); Merriam, E. F., ‹History of the American Baptist Missions› (1902); Strong, W. E., ‹Story of the American Board of Commissioners for Foreign Missions› (1910); Canton, ‹History of the British and Foreign Bible Society› (5 vols., 1904); Dwight, ‹Centennial History of the American Bible Society› (1916); Report of the Centenary Missionary Conference (London 1888); Report of the Ecumenical Conference (New York 1900); Reports of the World Missionary Conference (Edinburgh 1910); Dennis, ‹Christian Missions and Social Progress› (3 vols., 1897–1906). *On Special Fields:* Reports of the great Shanghai Conference (1907); MacGillivray, ‹China Missions' Year Book› (1915); Gibson, ‹Mission Problems and Mission Methods in South China› (1893); Inglis, ‹India's Protestant Missionary Directory› (1915); Jones, ‹India's Problem› (1903); Dearing and others, ‹The Christian Movement in Japan› (1915); Stewart, ‹Dawn in the Dark Continent› (1903); Stock, ‹The Story of Uganda› (1894); Curtis, ‹The Laos of North Siam› (1903); Brown, ‹The New Era in the Philippines› (1903); Zwemer, ‹Mohammed or Christ?› (1916); Wilson, ‹Modern Movements among Moslems› (1915); Dwight, ‹Constantinople and its Problems› (1901); Beach and others, ‹Protestant Missions in South America› (1900); St. John, B., ‹A Comparison in Missionary Statistics› (in *The Missionary Review of the World,* Vol. XLI, pp. 356–359, New York 1918).

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MISSIONS, Protestant Home. Home missionary effort in the United States is older than its organized form. Before the War of the Revolution individual churches in New England and New York were sending their pastors, for weeks or months at a time, into the new settlements, to preach the Gospel and administer the ordinances of religion. Connecticut pastors received for this service $4 a week, and $4 more were allowed for the supply of their pulpits, the money being raised by voluntary subscriptions among the home churches. These desultory efforts continued more or less intermittently for 25 years; they were warmly welcomed by the struggling settlements and were influential in preparing the way for better organized endeavors.

Organized American home missions began with the establishment of the «Missionary Society of Connecticut,» 21 June 1798, by the Congregational churches of that State. Massachusetts Congregationalists followed one year later, 1799, with the «Massachusetts Missionary Society.» Both of these Societies, bearing the names of the States where they originated, and supported by the States whose names they bear, were not primarily for the benefit of Connecticut and Massachusetts. The object of the Connecticut Society, as stated in its charter, was «to Christianize the heathen (Indians) of North America and to support and promote Christian Knowledge in the New Settlements of the United States.» The charter of the Massachusetts Society describes its object as being «to diffuse the Gospel among the heathen (Indians) as well as other peoples in the remote parts of our country.» Both Societies, therefore, while local in their origin and support, were truly national in spirit and aim. Other New England States followed the lead of Connecticut and Massachusetts in organizing similar societies; New Hampshire in 1801; Rhode Island in 1803; Maine and Vermont in 1807, all of them under Congregational auspices. They all continue to the present time with but slight changes in name, and with increasing devotion to home missions, State and national. The first organized movement on the part of the Baptist churches was made in 1802, when the «Massachusetts Domestic Missionary Society» was established at Boston, with the same broad object as its Congregational predecessors, namely, «to furnish occasional preaching and to promote the knowledge of evangelistic truth in the new settlements of these United States, or further, if circumstances should render it proper.» To the same year 1802 belongs the first systematic effort of the Presbyterians of New York, Pennsylvania and New Jersey, acting under the same broad charter with those of the Congregationalists and Baptists of New England; «to send forth missionaries well qualified to be employed in mission work on the frontiers, for the purpose of organizing churches, administering ordinances, ordaining elders, collecting information concerning the state of religion in those parts, and preparing the best means of establishing a Gospel ministry among the people.» Meanwhile the Reformed Church of America had not been idle. Sporadic missionary work began with it as early as 1786, culminating in 1822 in the organization of the «Missionary Society of the Reformed Dutch Church,» differing nothing in spirit from its forerunners, but with a wider scope, as it included home and foreign missions under a single organization. Methodist and Episcopal missions, as well as the Lutheran and those of the Disciples of Christ, belong necessarily to a later period.

It is important, historically, to remember that all these early missionary bodies were called into being by one motive and for one object. Barbarism in the new settlements was the common dread of the East, and to prevent such a disaster by pre-empting those rapidly gathering communities with religious institutions was the motive of all early home missionary organizations. At the opening of the 19th century, what was known as the new settlements were found mainly in northern New England, eastern and central New York and northern and southern Ohio, and these were the first points of home missionary attack. The opening of the Northwest Territory and the passage of the Ordinance of 1787 attracted a stream of emigration from the East, mingling with which was a considerable element from Great Britain, Holland, Scandinavia, Germany and Moravia, Belgium and Switzerland. The earlier settlers in New York, Ohio, Indiana and Illinois were generally Protestant in their sympathies, but unable at once, with a new country to subdue and new homes to be built, to provide themselves with the institutions of worship. To the help of these hopeful but destitute settlers came the missionary organizations of the East. Their missionaries were hurried forward to every needy point, not only in the wilds of New York and Ohio, but to the remoter settlements of Indiana, Illinois, Kentucky and Tennessee. They even found their way down the Mississippi to New Orleans and crossed the northern borders to Canada. A specially promising field of effort was a section of Ohio, bordering on Lake Erie, settled chiefly by emigrants from Connecticut and for this reason commonly known as «New Connecticut.» At the beginning of the century the tract contained about 1,400 inhabitants. In 1804, it had 400 families; one year later the 400 had become 1,100, one-half of them from New England. In less than 30 years from the beginning of organized home missions 90 churches had been planted, all of them by home missionaries sent out and supported by Connecticut and Massachusetts. To sum up in a sentence the work of the Missionary Society of Connecticut at the end of 30 years, 200 missionaries had been employed whose joint labors were equivalent to 500 years of ordinary service by one man, and 400 churches had been established in the new settlements of the land. With what wear and tear of body, with what sacrifice of comforts in the wilderness, with what patience of hope and courage of faith and labors of love, no words can fitly portray. Not a mile of railroad had been built. The river and the canal, the stage coach, the emigrant wagon and the saddle, were the only conveniences of travel, and to these the missionary added footsore and weary tramps from settlement to settlement. During the same period 125 Puritan churches had been gathered in the growing settlements of New York State, supported in whole or in part by home missionary funds.

All these earlier efforts were marked by a commendable absence of the sectarian spirit. A common danger threatened the nation. The problem presented to the churches of the East was how to overtake the new and rapidly multiplying settlements with the means of Christian civilization. No rivalry entered into the struggle but only a strong sense of the need of prompt, united action. In their love of humanity and of country every thought of denominational supremacy was buried under the all-absorbing issue whether the New America should be heathen or Christian. This spirit was particularly active between Presbyterians and Congregationalists which were then the strongest church bodies in the land; for 50 years, between 1801 and 1851, they carried on their missionary work in the new settlements under a «Plan of Union,» mutually agreed to, by which the churches of either order, wherever formed, might worship in the same house, listen to the same pastor and profess the same creed, while at the same time they were left free to govern themselves by the polity they loved and preferred.

In 1826 Congregational, Presbyterian, Reformed and Associated Reformed churches united at New York City in organizing a National Society. Such change of policy had become necessary. Hitherto, State societies had been doing national work, each in its own way. But several missionary organizations working independently had resulted in an unequal distribution of men and money. Some sections had been over-supplied and others were left destitute. Moreover, the laborers themselves came into conflict with each other. The time had arrived for federation and co-ordination of effort, and to this end the American Home Missionary Society was organized, as above stated, with headquarters in New York City, the various State societies making themselves auxiliaries to the national organization. Perhaps nothing more potential in the progress of American Home Missions belongs to its history than this act. For years the churches making alliance labored together in fraternal unity, contributing to a common treasury and governed by a single board of direction. Receipts rapidly increased, the missionary force doubled and trebled, and instead of being an itinerant preacher, the home missionary became a settled pastor, dwelling among his people. It was only when these allied church bodies had grown strong that they withdrew one by one to organize separate societies, leaving the Congregationalists to inherit the name and traditions of this honored organization. Indeed, it was not until many years later that «American» was dropped from its charter name and the designation of «Congregational» was substituted. Meanwhile the Methodists had organized their «Missionary Society» (national) in 1819, including home and foreign work; the Episcopal Church, its «Domestic and Foreign Missionary Society,» in 1821; the Baptists, their «American Baptist Home Mission Society» in 1832, also national; the Lutherans, their «Home Missionary Society of the General Synod» in 1845, and the Disciples, their «American Christian Missionary Society,» in 1849. The Southern Presbyterians, Southern Baptists and Southern Methodists have also their home missionary organizations which are doing a great religious work in the Southern States. Thus, by natural evolution, all the leading Church bodies of America have gradually become organized for home evangelization and a movement, which began in 1798 for the Christian enlightenment of the new settlements, has developed into a system as broad as the national domain, by which the stronger churches of the land are sharing the burdens of their weaker brethren and strengthening those forces of Christian civilization upon which the safety of the nation depends.

The purchase of Louisiana (q.v.) in 1803 imparted a mighty impulse to the missionary movement. That expansion gave us the mouth of the Mississippi and undisturbed possession of its entire course. It carried our western boundary from Lake Superior to the Rocky Mountains, doubling the national area by a stroke of the pen. Fourteen States and Territories have been carved out of the Louisiana Purchase. They include the great corn and wheat belts of America, and their underground treasures are among the richest of the world. Emigration from the East and Middle West began at once and has reached enormous proportions. It is rivaled in volume only by the millions of foreign birth that have poured and are still pouring into this new and mighty West. By these movements a great missionary problem was presented which the organized home missionary army welcomed with zeal and have never wearied in their efforts to solve. The order of missionary progress through the Louisiana Purchase was strictly along lines of immigration. There is not a State in that vast tract which the home missionary did not enter while it was yet a Territory, and always in the first and feeblest stages of settlement. From Missouri to Iowa, from Iowa to Minnesota, Kansas and Nebraska, thence to the Dakotas, and on from these points to Wyoming, Colorado and Montana, and last of all, when the door was opened to Oklahoma, until every State in this imperial purchase has been leavened with Christian institutions. Something of the volume of this work may be gathered from the fact that in 1916 over 30,000 Protestant churches were enumerated within the Louisiana Purchase, holding property to the value of $80,000,000 and having 2,700,000 communicants, and, with rare exceptions, this church growth is the fruit of home missionary culture, begun, maintained and supported until the need ceased, by the missionary revenues of these Eastern societies. The same process was repeated when about midway in the century the Oregon Treaty made sure our possession of the Northwest and the discovery of gold opened the Californias to the world. Home missionaries ordained in the East promptly started for the Pacific Coast reaching their fields by the way of Cape Horn and the Sandwich Islands. The strategic positioin of the far West and Northwest as related to the work of foreign missions in China and Japan was keenly appreciated by the churches and their missionary boards at the East. Money was contributed freely and many of the ablest preachers of the East went forth cheerfully to lay the foundations of Christian society on the sunset shores of the republic. «The Mexican Cession,» including Texas, New Mexico, Arizona and Utah, was another belt of peculiar missionary need, which in spite of ancient superstitions and modern delusions has proved a rich field of rewarding home missionary effort.

The close of the Civil War introduced, at the South, a home missionary problem that was absolutely new, and which continues to absorb the interest of Northern churches to an extraordinary degree. Four million slaves were suddenly set free. Government opened its bureaus of relief, and the churches of the North through their missionary boards, hurried forward preachers and teachers. The greatness of the opportunity quickened the home missionary spirit of the whole country. Several of the boards opened freedmen's departments and the churches magnified the privilege of responding to their appeals. To the missionary, himself, there was in this call an element of peril which, so far from deterring him, only stimulated his zeal. The Yankee preacher and teacher were not well received at first by the white South. Social ostracism was not the only penalty they had to face for their devotion. Violence to their persons and destruction of their property were not infrequent in the early years of this missionary endeavor. An ugly spirit of caste included the negro teacher with the negro and young women delicately reared in the best homes of the North suffered from neglect or open indignity. These conditions have mostly passed away; respect and even gratitude, on the part of the South, have been won, as the fruits of this vast home missionary effort have become more apparent. These fruits appear not only in organized churches for the negro race, but in a long array of universities, colleges, academies, normal, common and industrial schools, planted exclusively for the benefit of the blacks, all of them specifically Christian, and all of them originally supported by the free-will offerings of Northen churches. Howard, Hampton and Fiske, Atlanta and Tugaloo, Talladega and Straight, Shaw and Richmond, Wayland and Leland, Nashville and Bishop, and a host besides, are names as familiar to the educational world as Harvard, Yale or Princeton. They are all the fruit of negro emancipation and all of them are the creation of home missionary interest and enterprise.

It was in 1840 that foreign immigration began to attract the attention of the friends of home missions. Up to that time its entire volume from all sources had not exceeded 500,000. Then began the flood. During the next 30 years the country received about 6,000,000 foreigners. Driven by famines and oppressions at home and drawn by the opportunities of labor in a new country and by our generous homestead laws, they were arriving, for continuous years, at the rate of 500 to 1,000 per day. Between 1865 and 1885 more than 7,000,000 were added to our foreign population, which means that in these 20 years foreign immigration exceeded that of the entire previous record of the country. It is needless to say that, as this vast problem began to be measured and sanely comprehended by the churches, the appeal of home missions was almost revolutionized. Hitherto that appeal came from our own people and often from our own kin. To follow close after them on the westward trail and to stand with them in planting the church and the school had been for years the whole of home missions. While this feature has never lost its claim and probably never will, another claim has entered to divide the attention and concern of the churches. To the peril of domestic heathenism has been joined the larger fear of imported barbarism, and thus for many years foreign missions at home has come to be a distinct interest of American home missions. All branches of the church have taken part, through their organized societies, in this effort to Christianize the alien. No nationality has been overlooked; Germans and Scandinavians, Bohemians, Poles and Russians, Hollanders and Hebrews, Spanish, French, Italians, Armenians, Chinese, every sort and condition of foreigners, however forbidding or hopeless, has been made the object of home missionary culture, with results that have astonished the most sanguine believer and rebuked the most despairing doubter and which have all but silenced the prophets of evil who predicted the direst consequences from the infusion of so much foreign blood into the moral, social and political life of the nation. Many times over it has been demonstrated that every grade of foreign immigrant is susceptible to religious development and is entirely capable of being both civilized and Christianized, and is in fact being rapidly assimilated, through the agencies of education and religion, into the best types of American life. Great migrations are not feared to-day as they were in 1840. Fears have been quieted and the native American stock have come to view with less and less alarm what 50 years ago almost crazed them with apprehension.

To attempt any adequate summary of the results of home missions at the end of 120 years would require a survey of the development of 50 States and Territories so vitally have the home missionary and his work entered into the beginnings and the early history of all our Commonwealths. A few salient facts must suffice. The vitality of the home missionary idea has shown itself, first of all, in the growth of organizations. Beginning in 1798 with the Connecticut Missionary Society it has multiplied itself into more than 30 home missionary bodies, all Protestant, all evangelical and all national. These organizations have collected and disbursed $150,000,000. Their chief agent has been the Church, with its ordained preacher and its divinely appointed ordinances, and for the Church, these millions have been given. This total, however, takes no account of co-operating agencies, which have been called into being to serve the missionary work of the churches. Add these: Sunday school planting; Bible and tract printing; church building and Christian education; which by careful inquiries are found to have expended $150,000,000 more, and the grand total for home missions, root and branch, in organized form, is $320,000,000. Not a dollar of this immense fund has been *paid* in any commercial sense for value received. All of it has been *given*, a free-will offering of Christian people to mark their intense conviction of the peril of a nation without the Gospel and their supreme faith in its leavening power. What have these millions accomplished and what of visible fruits remain to justify their cost? It is a fact not generally known, and when known not sufficiently appreciated, that the great evangelical bodies of the United States trace most of their church organizations directly to home missions. Congregationalists admit that four-fifths of their churches are of home missionary origin. The proportion would be larger but for the fact that hundreds of their churches were born before home missions began. Presbyterians confess that nine-tenths of their churches are of home missionary planting. Baptist, Methodist and Episcopal estimates range from five-sixths to nine-tenths. Such ratios can mean but one thing: that these far-spreading ecclesiastical bodies have become strong in church power, not by their own help, but by home missionary aid, the few, strong, bearing the burdens of the many, weak, and they answer the inquiry which suggests itself at once to a thinking mind: where and what would these ecclesiastical establishments be to-day but for the helpful agency of organized home missions? To the credit of home missions, therefore, should stand the undoubted truth, that an overwhelming majority of the evangelical churches of America owe their being to its nurture and care. What does such a fact mean in the religious development of the country? In the year 1800 the United States had one evangelical communicant in 14.50 of the population. In 1850 that ratio had grown to one in 6.57; in 1870, to one in 5.78; in 1880, to one in 5; in 1890, to one in 4.53, and in 1900, to one in 4.25. In other words, evangelical church membership increased three and one-half times faster than the population in less than 100 years. Between 1800 and 1890 population increased 11.8 fold; in the same period evangelical church membership increased 38 fold. To these figures Dr. Daniel Dorchester, their compiler, adds the comment: «This exhibit of religious progress cannot be paralleled in the history of God's kingdom in any land or any age.» It is only 140 years since Voltaire in Geneva declared: «Before the beginning of the 19th century Christianity will have disappeared from the earth,» and it is less than 100 years ago that American infidels were prophesying that the Church would not survive two generations in this country. In defiance of these dismal auguries the average yearly increase of evangelical communicants has fulfilled the prophecy of a larger average than ever for the 20th century. It is no vain boast, therefore, but the obvious truth, that by far the larger part of this remarkable growth is due to the direct agency of American home missions, since in its own carefully planted gardens most of this growth has taken place. But not the only, nor even the highest, fruits of home missionary efforts are contained in the numerical results. President Roosevelt, in a public address, declared: «It is such missionary work that prevented the pioneers from sinking perilously near the level of the savagery against which they contended. Without it the conquest of this continent would have had little but an animal side. Because of it, deep beneath and through the national character, there runs that power of firm adherence to a lofty ideal upon which the safety of the nation will ultimately depend.» Thus home missions has been in a very true and high sense both the builder and the savior of the American nation. In a government of the people and by the people nothing counts for so much as high ideals of duty. With these enthroned in the thought and life of its citizens a nation may meet any shock from within or from without; and nothing has yet been discovered on earth or revealed from heaven that has the power to create higher ideals of duty than Christianity and the obligations it inculcates. It is thus that missionary societies, whose sole function is the planting of churches, enter into the hidden life of a nation in ways that political parties can never enter, and which even Christian men are sometimes slow to appreciate. Not only law, order, temperance, respect for the Sabbath, security of life and property and the claims of humanity are thus conserved and fostered, but the instinct of patriotism itself, in which the very life of the nation consists, finds its nursing mother in the Church of Christ. Many victories of a Christianly educated public sentiment might be cited in American history, but the Civil War of 1861 furnishes a typical example. When that inevitable conflict came the value of 65 years of church planting by American home missions in the East, the West and the Northwest began to appear. Every home missionary pulpit flamed with patriotic fire and summoned its worshipers to arms. Congregations and Sunday schools were decimated by enlistments. From a careful inquiry made near the close of the war it was ascertained that the home missionary churches of the entire West, on both sides of the Mississippi, «had sent into the army one in four of their entire male membership, including in the count old men, invalids and boys.» Commenting on this fact that peerless interpreter of history, Richard Salter Storrs, was moved to declare in his Brooklyn pulpit, «Home missions saved this country once, and will save it again if necessary.»

Bibliography.— Bacon, L. W., ‹History of American Christianity› (1898); Carrol, H. K., ‹Religious Forces of the United States› (1893); Clark, J. B., ‹Leavening the Nation› (1893); «Connor, R.» (Gordon, C. W.), ‹Black Rock› (1898); ‹Sky Pilot› (1899); Dorchester, D., ‹The Problem of Religious Progress› (1881); Dubois, W. E. B., ‹The Souls of Black Folk› (1903); Dunning, A. E., ‹Congregationalists in America› (1894); Monroe, H. E., ‹Twice-born Men in America› (Philadelphia 1914); Morehouse, H. L., ‹Baptist Home Missions› (1904); Puddefoot, W. G., ‹The Minute Man on the Frontier› (1895); Riis, J., ‹Battle with the Slum› (1902); Storrs, R. S., ‹The Divine Origin of Christianity› (1884); Strong, J., ‹Our Country› (1885); ‹The New Era› (1893); ‹Religious Movements for Social Betterment› (1900); ‹The Next Great Awakening› (1905); Thompson, R. E., ‹The Hand of God in American History› (1902); Washington, B. T., ‹Up from Slavery› (1901); Whipple, H. B., ‹Lights and Shadows of a Long Episcopate› (1899).

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MISSIONS, Roman Catholic Church, Home and Foreign. A complete account of the missions in the Roman Catholic Church would be coterminous with the history of the growth and progress of Christianity, for the Church is essentially missionary. The commission that was given to the Apostles, by the Founder of Christianity, was not to establish a system of philosophy, nor even to maintain a ceremonial form of worship, but it was «Go ye into the whole world and preach the gospel to every creature.» For the first time in the history of the world was there conceived a project of forming a world-wide institution, that would embrace all nations under one headship, no matter how divergent their ideas or their racial traits. The measure of the universality of the Redemption was the fact that the Church was not to be national or racial, but it was to be Catholic or Universal, for all peoples and for all ages. It was designed to be the continuation of the beneficent work of the Incarnation of the Son of God «unto the consummation of all things.» To create this world-wide institution, the primary business of the Apostles and their successors was to preach the gospel to every creature, and the highest vocation of the Church therefore is the missionary vocation.

It would be difficult, then, to give anything but a meagre sketch of the efforts that were put forth to widen the saving influences of the Church, and the ultimate crystallization of the fruits of these efforts into the marvelously complex organization, whose centre is in Rome and whose ramifications extend to the uttermost ends of the earth.

The history of the work of the missions begins on the first Pentecost in the market place of Jerusalem, wherein were gathered representatives from all the nations of the earth. The providence of God had prepared the time and the place through a thousand years of effort, first by preserving the monotheistic idea of God among the Jews, second by importing Greek culture and intellectuality (it was no mere accident that led to the translation of the sacred writings of the Hebrews into the Greek Septuagint), and third, by creating the great civil organizations of the Roman Empire, whose well-made roads led to the pillars of Hercules on the west and to the waters of the Danube on the east and beyond. The same providence of God that had prepared the soil selected the special psychological moment for the seed-sowing, and on the first Pentecost, Peter stood up in the midst of that throng in the market place and preached the first great missionary sermon, a verbatim report of which is given to us by Luke the Evangelist and in Greek, too, that all the world might read it (Acts ii). There were 3,000 converts made that day. The same chronicler tells later on of the missionary journeys of Paul and of the many neophytes that were baptized into the Church. Finally both Peter and Paul came to the city of Rome, and there the Prince of the Apostles set up his throne under the shadow of the throne of the imperial Cæsars, and there it has remained ever since, and out from Rome, and with the authority of the Roman pontiffs, have gone the missionaries that have converted the heathen world to Christianity. Into Italy they went, and beyond into Gaul and Hispania and into the forests of Germany, and along the Danube into the regions of eastern Europe. Before three centuries went by the missionaries with Roman Catholic ordination celebrated the divine mysteries and with Roman Catholic consecration exercised ecclesiastical jurisdiction, and after they had preached Roman Catholic doctrine and had gathered the fruits of their labors, they brought them to the feet of the Roman pontiff for his blessing. A good type of this work is seen in the conversion of Britain. Pope Eleutherius (178 A.D.) sent Fugatus and Damianus to Britain at the request of Lucius, a British chieftain, and an incipient hierarchy was established. (Bede, I, ch. iv); (Tertullian, ‘Adv. Hær.’ 1).

During the persecution of Diocletian (303 A.D.) many Christians in Britain were done to death and the British martyrology was headed by the illustrious Saint Alban. The happy effect of the change that was wrought by the edicts of Constantine was a source of joy in Britain, because Constantine's mother, Helena, was the daughter of a British prince, and his father, Constantius, was converted and died in the faith at York in Britain. (Euseb. in ‘Vitæ,’ 17). When the Pelagian heresy began to disturb the faithful of Britain at the instance of the deacon Palladius, Pope Celestine sent Germanus of Auxerre, in his own stead, to drive out the heretics. (Saint Prosper's ‘Chronicle,’ 429 A.D.). So with more or less fervor of piety (Gildas, ch. vii) Britain preserved the faith of the Roman Catholic Church "entire and inviolate" and maintained the succession of British bishops up to the time of Saint Augustine, whom Pope Gregory the Great (597 A.D.) sent to England to convert the Anglo-Saxon, and for a thousand years afterward all spiritual jurisdiction was from Rome.

The same story is true in Ireland: Saint Patrick was sent by Pope Celestine; Saint Boniface went into Germany with a similar message and authority, and in a like way Denmark and the Scandinavian Peninsula were brought in subjugation to the yoke of Christ. The missionary went first, and as has been done in India and in China in the 19th century, then gradually the native churches began to grow in numbers, a bishop was sent with consecration and authority from Rome, and the nascent church assumed definite organization until in the course of time it grew into hierarchical perfection. Looking at the missionary work of the Roman Catholic Church from one point of view, there are no foreign missions, because she is a worldwide organization, at home in every land.

This work of evangelizing the countries of Europe went on with more or less ardor all through the Middle Ages. The barbarian races rushed in at the breaking up of the Roman Empire and while the military power was too weak to stem the onward rush, still the spiritual masters of the Church met them and chastened their fierce, warlike spirits, and made them submissive to law and order. The vast monastic system grew up. Canon Farrar says:

> "Under the influence of Catholicism the monasteries preserved learning and maintained the sense of the unity of Christendom. Under the combined influence of both, grew up the lovely idea of chivalry molding generous instincts into gallant institutions, making the body vigorous and the soul pure, and wedding the Christian virtues of humility and tenderness to the national graces of courtesy and strength. During this period, the Church was the one mighty witness for light in an age of darkness, for order in an age of lawlessness, for personal holiness in an epoch of licentious rage. Amid the despotism of kings and the turbulence of aristocracies it was an inestimable blessing that there should be a power which by the unarmed majesty of simple goodness made the haughtiest and boldest respect the interests of justice, and tremble at the thought of temperance, righteousness and judgment to come."

The Crusades were but great witnesses to the missionary power of the Church, and they did not a little to break the power of Islam and save Europe from Mohammedan blight. In the 11th century came the great preaching orders, notably the Dominicans and the Franciscans, and for the next three centuries the voices of these missionaries were heard in every corner of the civilized world. The fall of Constantinople and the consequent spread of the city's learned men through the West was a new leaven to awaken the European mind, and the invention of the astrolabe, together with the art of printing from movable types, gave a new impetus to the missionary movement. Columbus was filled with this spirit, and one of his deepest purposes was to find a shorter way to India and the East in order to bring the gospel to the people who sat in darkness and in the shadow of death. His expedition from Palos was a profoundly religious affair, and on his return from the newly-discovered continent he brought six dusky savages, who were duly instructed and baptized, and Queen Isabella stood at the font of baptism as their godmother. These six converts to Catholicism (1498) have become the 14,000,000 Catholics of the United States to-day. Other discoverers followed Columbus, and while their voyage was in many instances a search for the «Golden Fleece,» yet they invariably brought with them missionaries, and wherever they landed their first act was to erect the cross and gather the natives to listen to the tidings of salvation. The Cabots planted the cross on Cape Cod 120 years before the landing of the Puritans at Plymouth Rock. Champlain, who, as Bancroft says, «considered the salvation of one soul more important than the conquest of an empire,» opened the Northwest to civilization. Cortez introduced missionaries among the Indians of Mexico, and La Salle, who had been trained in a Jesuit novitiate, brilliant, restless, daring, went by the way of the Great Lakes and down the Mississippi and opened the West to missionary effort.

While the stories of the wonderful Western World were being whispered in Europe a little knot of ardent spirits gathered about Ignatius Loyola at Paris and plighted their vows to work for God. One of the number was Saint Francis Xavier, who within two decades preached and baptized hundreds of thousands in India and penetrated to the very gateway of China. During the 16th century fierce religious dissensions broke out in Europe, and the German and English nations were lost to the Church, but the Jesuit missionaries, together with the Franciscans and Dominicans, made a mighty recompense for the losses in Europe by the gains they secured in India among the Brahmans, in China among the Confucianists, in South America among the Indians and in North America among the savages.

The 16th and 17th centuries were marvelous in the record of missionary triumphs. China had been a sealed book for 2,000 years, but «Where neither merchant nor traveler has penetrated the Roman Catholic missionaries have found their way.» (Gutzlaff, ‹China Opened,› Vol. I, ch. 6). They brought to Europe exact knowledge of the hidden empire and they did it in defiance of every menace of torture and of death. In 1583 Father Ricci landed at Canton, and for 27 years, in the habit of a Bonze or a Literati, he pursued his way to the imperial throne and baptized many princes of the reigning family. When he died there were more than 300 churches in the different provinces (Gutzlaff, ‹History of China,› Vol. II), and by his public interment, with the emperor's official sanction, Christianity was legalized in China (Abbe Huc, Tome II). He was succeeded by Father Adam Schaal, S.J., who taught the Chinese all they know of mathematical science, and later on by other missionaries. The storm of persecution came and «more than 300 churches were either destroyed or converted to profane uses, and more than 300,000 Christians were abandoned to the fury of the heathen» (Du Halde). The story of their dreadful sufferings, their fierce tortures and their agonizing deaths read like the acts of the martyrs in the early Roman persecutions. In the meantime the evangelization of the Philippines was going on. Three centuries of effort has left 6,000,000 of the Malay race deeply imbued with the principles of Christianity, so that Peyton (Episcopalian) was able to write of them:

> "I found in all the towns a magnificent church. I attended mass several times, and the churches were always full of natives, even under unfavorable circumstances, on account of the military occupation. There are almost no seats in these churches, the services lasting from an hour to an hour and a half. Never in my life have I observed more evident signs of deep devotion than those I witnessed there — the men kneeling or prostrated before the altar, and the women on their knees or seated on the floor. Nobody left the church during the services, nor spoke to any one. There is no sectarian spirit there. All have been instructed in the creed, in prayer, in the ten commandments, and in the catechism. All have been baptized in infancy. I do not know that there exists in the world a people as pure, as moral, and as devout as the Filipino people. (Report of Philippine Commission)."

South America, too, had been traversed by the missionary, and the Indians of the Andes as well as the wild tribes of Paraguay had accepted the religion of Christ. Whatever the races of South America and of Mexico know of Christianity to-day, they have learned it from the missionaries of the Roman Catholic Church.

Since the year 1622 the work of the «Missions» has been so specialized as to make it a department of Church administration. In that year Pope Gregory XV canonically instituted the Congregation de Propaganda Fide and gave to it the duties of Church extension. The cardinal prefect of the Propaganda is second only to the Pope himself in power, for he has jurisdiction over all so-called missionary countries. The present prefect, the venerable Cardinal Gotti, is assisted by 25 other cardinals and as many consultors, making a quasi-senate for the administration of Church affairs. Affiliated with the Propaganda there are a half a hundred colleges and seminaries for the education of the natives of the missionary countries, and in these colleges most of the languages of the civilized and uncivilized world are taught. The Propaganda had a polyglot press for the printing of literature.

In 1862 Pope Pius IX instituted a special congregation for the affairs of the Oriental churches, for the Roman Catholic Church exercises a jurisdiction not only in Europe but over portions of the ancient Eastern churches whose beginnings are traceable to the Apostles other than Saint Peter, and claims a jurisdiction over them all through the primacy of Saint Peter. These churches in communion with the Pope are united in a complete doctrinal life, that is, all and every one of the dogmatic teachings of the Roman Catholic Church are accepted by the adherents of these Eastern churches, though they are permitted to retain their ancient liturgies which may be peculiarly their own, and they are not obliged to conform in all matters of discipline, as, in some instances, a married clergy is permitted among them. A distinction has always been made between the acceptation of the dogmatic formularies and the toleration of varying rites and ceremonies. In the former the Church is most exacting, she never permits the least variation in the letter or the spirit of her teaching, but like an indulgent mother she permits her children to maintain their time-honored customs, liturgies and languages.

The Oriental rites, under the administration of the Propaganda, are as follows:

1. The Ethiopian or Abyssinian Rite, principally in the Abyssinian Church, first planted by Saint Matthew, increased by Saint Frumentus, in the 4th century, was represented at Council of Florence 1445,— principal missionary of modern times Joseph Sapeto. It includes 30,000 souls.

2. Armenian Rite — gospel first preached by Gregory the Illuminator, though the modern Church was reorganized by constituting the bishop of Cilicia as patriarch of the Armenians. The liturgy is in ancient Armenian. It includes 109,000 lay members and 357 priests.

3. Coptic Rite.— Church first established by Saint Mark, disciple of Saint Peter and bishop of Alexandria in Egypt. The people went into schism under Dioscorus, but later on were restored to the unity of the faith. The bishop of Alexandria is the patriarch; 22,500 members with 44 priests.

4. Greek Rite — subdivided into (1) Pure Greek in which the Greek language alone is used; (2) Rumanian Greek; (3) Bulgarian Greek, using the Slav language; (4) Ruthenian Greek, and (5) the Melchite Greek. The entire Greek rite in communion with Rome numbers 4,645,803 members with 5,251 priests. They have numerous seminaries and educational institutions.

5. Syriac Rite subdivided into (1) Pure Syriac; (2) the Syro-Chaldaic; (3) the Syro-Malabaric, and (4) the Maronites. The Syrians number 626,029 with 1,171 priests. All these Oriental rites together make a total of 5,433,332 members under the administration of many bishops and 6,823 priests. Many of these Eastern churches have their seminaries for the training of their missionary priests in the city of Rome. Under the jurisdiction of the Propaganda, according to official statistics, there are:

Oriental churches — 5,433,332 members, 6,825 priests.

Occidental churches — 27,218,297 members, 33,148 priests.

The latter are distributed as follows:

	Members	Priests
England	1,362,489	2,674
Scotland	373,500	432
Ireland	3,547,079	3,445
Norway Sweden Denmark	9,750	74
Holland	1,854,340	3,168
Balkan Peninsular	686,210	890
Greece	34,710	109
Turkey	129,680	310
Persia	7,650	11
Arabia	1,500	11
India (Eng.)	1,870,000	1,180
China Indian (Peninsular)	827,680	823
Malay, Borneo, Java, Siam	57,800	89
Chinese Empire	532,448	1,168
Korea and Japan	84,410	772
Africa	458,170	1,015
British America	2,187,480	2,766
United States	9,479,250	*10,049
West Indies	339,200	195
Patagonia	99,500	70
Australia	704,170	736
Polynesia	196,850	348

This list does not include the Philippine Islands, Porto Rico, Cuba, Mexico nor any of the South American countries, as these countries were ancient dependencies of Spain, and therefore not under the Propaganda. The total aggregate under both branches of the Propaganda or the Missionary department of the Roman Catholic Church at the close of the century was over 32,000,000 with about 40,000 priests.

This statement does not take into account the large army of teaching orders of brothers and sisters and native catechists, nor does it give any estimate of the educational institutions, hospitals and orphan asylums that are under the auspices of the Church in these countries. Some idea of the growth of the missionary work of the Church may be realized from the fact that at the beginning of the 19th century there were only 5,000,000 under the jurisdiction of the Propaganda; at the beginning of the 20th century there were over six times that number.

This account will be incomplete without some statement of the material resources by which the missions have been carried on. The Congregation of the Propaganda has vast funded resources amounting to $135,000,000, the revenues of which are applied to the support of the work and the colleges under its care. Beside this there have grown up during the 19th century many auxiliary societies; the principal one is known as the Lyons' Society for the Propagation of the Faith. It began with the idea of assisting the poverty stricken missions in New Orleans under Bishop Dubourg, but it soon broadened its scope. It asked only a cent a week from its members, and during its existence (1822–1900) it has gathered and spent $65,690,017. The *Annals of the Propagation of the Faith*, the official organ of this society, is now issuing 300,000 copies every two months and in 12 different languages. There are 58 different religious societies of priests engaged in the work of the missions, together with 82 orders of brothers who have no aspirations to the priesthood, yet are consecrated to missionary work, and 434 different orders of religious sisterhoods. These 574 different societies embrace a membership numbering very nearly 100,000 who have left all that this world holds dear, of houses, land, country and the pleasures of the domestic hearth, and have sacrificed their lives in poverty, celibacy and exile for the souls of the heathen and the unevangelized. Their consecration to this life is not for a few years, but they count it their greatest joy to spend and be spent till death comes, that the blessed name of Jesus Christ may be better known and more deeply loved.

Under the caption of Home Missions, a short account may be given of the missions to non-Catholics in the United States. The idea of the need of organized effort to present the teachings of the Catholic Church to the American people is what brought together five priests, Isaac Hecker, Augustine F. Hewitt, Clarence Walworth, Francis Baker and George Deshon, who founded the organization known as the Paulist Fathers (q.v.). This idea was practically systematized in its present form by Rev. Walter Elliott, in September 1893, when he began, in Michigan, a series of missions in public halls and churches for the purpose of explaining the doctrines of the Catholic Church. These missions to non-Catholics prohibited controversy and invited the spirit of inquiry by placing a «Question Box» at the door, into which were dropped all questions concerning the teachings of the Church which anyone desired to have answered. During the last 10 years the work has grown to vast proportions. While the Paulists inaugurated the movement in the United States, yet the work is the normal work of the Church, and therefore belongs to every branch of the service, particularly to the diocesan clergy. The leaders of the movement contemplate the placing in every diocese a band of talented preachers whose business will be extra-parochial and whose duties will be to go into the towns and country places where the Church is weak, or does not exist, and arrange for the inauguration or strengthening of Church organizations. This band of diocesan missionaries will largely do the duties of a Church extension committee in the spiritual and missionary sense. The growth of this «Home Missionary Movement,» after 10 years, has been such as to necessitate the building of the Apostolic Mission House at the Catholic University at Washington. This institution will provide special lectures and instructions in missionary methods, and in this way will give training to the diocesan missionary. The legal organization which is financing the work is the «Catholic Missionary Union,» incorporated under the laws of the State of New York. Its president is the archbishop of New York, ex officio, and there are six other directors. The practical effect of 10 years of this home mission work has been to give the American people a more correct view of the teaching and spirit of the Catholic Church, to eliminate antagonisms and to make Church relationships more harmonious. It has also tended to increase, and this in no small degree, the stream of converts that has been flowing into the Church.

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* 11,289,710 population and **12,968 priests**.— Official Directory.

The growth of the Roman Catholic Church under the jurisdiction of the home missions during the last 100 years has been one of the marvels of the 19th century. The following figures give some measure of it: In 1800 there were 40 priests; in 1830 the number increased to 232; in 1850 to 1,800; in 1906 to 15,177. In 1800 the Catholic population was 100,000, in 1910 it is estimated at not less than 14,000,000. In 1800 there were but 25 churches; in 1910 there were 17,000. The value of church property, as given by census reports in 1850, was $9,256,758; in 1860 it was $26,774,119, a ratio of increase of 189 per cent, while the aggregate wealth of the country increased only 125 per cent. In 1870 it was $60,985,565. In 1906 value of church property had risen to $292,638,000.

While this external growth indicated by numerical strength and material wealth is very remarkable, the internal growth indicated by evidences of maturing organization as well as by signs of increasing spirituality is none the less remarkable. The first flowering of the Church's inner life is the vocations to the religious orders whereby men and women accept the call to the life of the evangelical counsels. In 1790 there was one convent with less than 10 religious, in 1909 there were over 5,000 convents with more than 60,000 religious. This army of men and women devote themselves without hope of worldy gain to the alleviation of the ills of humanity in the hospitals by the sick bed, in the tenements of the poor, in the slums among the depraved, in the asylums caring for the orphans and among the aged, who have been stranded on life's shore, without one cent of salary, contenting themselves with meagre fare, with short hours of sleep on a hard bed, and long hours of prayer and devotion to the sick and the poor and the wretched, because they know and are convinced that their reward will be very great in heaven. Many of these religious communities are offshoots of orders that have been established in the old country, but some are indigenous to the American soil. Noteworthy among the communities of men are the Paulist Fathers, founded by five converts, and among the women the Sisters of Charity, founded by Mother Seton, also a convert.

The growth in the Church in the United States of course is principally due to the great stream of immigrants, but not the least element of growth and present strength is the large number of converts who have been drawn to her through the conviction that she is the one Catholic and Apostolic Church. There are no accurate statistics of yearly conversions, but Cardinal Gibbons puts it in this way: «If the same ratio of conversions is preserved throughout the country as exists in the archdiocese of Baltimore, the yearly number of conversions would amount to 44,800 souls.» To sum up the aggregate number of Catholics under the American flag is as follows: United States (Cardinal Gibbons' estimate), 14,000,000; Philippines, 6,600,000; Porto Rico, 980,000; Hawaii, 33,000; American Samoa, 3,000; Guam, 9,000, making a total of 21,625,000 souls under the jurisdiction of an apostolic delegate, 14 archbishops and 88 bishops.

On account of the world-wide events culminating in the Great War, 1914–18, for several years it has not been possible to obtain statistics of Catholic foreign missions. It may, however, be safely said that the numbers of converts have greatly increased, in many cases have been doubled.

Bibliography.—‹La Gerarchia Cattolica e la Famiglia Pontificia Rome›; ‹Lettres Edifiantes et Curieuses des Mission Etrangères›; ‹Annals of the Propagation of the Faith›; Henrion, ‹Histoire Générale des Missions Catholiques depuis le XIIIe Siècle jusqu'à nos Jours›; Marshall, ‹Christian Missions›; ‹Collectanea Constitutionum, Decretorum, Indultorum ac Instructionum Santæ Sedis ad Usum Operariorum Apostolicorum Societatis Missionum ad Exteros›; ‹Missiones Catholicæ cura S. Cong. de Propaganda Fide descriptæ› in 1901 A.D.; ‹Socrietatis Jesu usque ad Sanguinis et Vitæ profusionem Militans in Europa, Africa, Asia, et America, contra Gentiles Mahometanos›; Tanner, ‹Travels of the Jesuits in various parts of the world›; Lockman, ‹The Catholic Missions›; ‹The Missionary› (*Quarterly Magazine,* 120 W. 60th street, New York); De Thiersant, ‹Le Catholicisme en Chine au VIIIe Siècle de Notre Ere›; Abbe Huc, ‹Christianity in China, Tartary and Tibet›; ‹History of Christianity in Cochin China and Tonking›; Shortland, ‹De Rebus Japonicis, Indicis, et Peruanis, Epistolæ Recentiores›; Hayo, ‹History of Church in

Japan'; Charlevoix, 'Christianity in Ceylon'; Tennent, 'Missions of the Zambesi'; Weld, 'Excursions in Afrique'; Van Sooy, 'Historia Ethiopica Ludolfus'; Tellez, 'Travels of Jesuits in Ethiopia'; Gutzlaff, 'History of China'; 'China Opened.'

Rev. A. P. Doyle, C.S.P.,
Secretary, The Catholic Missionary Union.

MISSISAGA (mĭs'sĭ-sâ'ạ) **INDIANS**, an American tribe of the Algonquian family residing in Ontario, Canada. In 1746 the tribe was admitted to the Iroquois confederacy. The name refers to the «eagle» and also to «great mouth,» signifying the outflow of the Missisaga River, near which they lived when first visited by French explorers. They signed a treaty in 1764 with an eagle as their tribal mark. There are upward of 600 of the Missisagas remaining. They inhabit small reservations in Ontario, are mostly Methodists and are progressive, industrious, self-supporting citizens.

MISSISSIPPI, one of the southern United States and the seventh admitted to the original Union, situated between lat. 30° 13′ and 35° N. and long. 88° 7′ and 91° 41′ W.; extreme length, north and south, 332 miles; average breadth, 142 miles, varying from 78 miles below lat. 31° N., to 189 miles on that parallel, and 118 miles on the north line; area, 48,610 square miles, being 1.61 per cent of the territorial extent of the United States. It is bounded north by Tennessee, east by Alabama, south, between the Alabama line and Pearl River, by the Gulf of Mexico, and from the Pearl to the Mississippi on the parallel of 31° N., by the State of Louisiana; and west by Louisiana and Arkansas, having below lat. 31° N. the Pearl River, and above that line the Mississippi as the dividing lines. The Round, Horn, Ship, Deer, Cat, Petit Bois and several other islands lying outside of and forming the southern limit of the Mississippi Sound belong to this State. Mississippi was admitted to the Union 10 Dec. 1817 and takes its name from the river which forms its western boundary for a distance of over 500 river miles. There are 80 counties in the State. The capital city is Jackson.

Topography.— Mississippi lies in two principal hydrographical divisions, separated by a low broad watershed; the eastern rivers flowing into the Gulf of Mexico, and the westernmost streams emptying into the Mississippi. East of the dividing broad ridge the surface of the State consists of broad rolling fertile prairies; the ridge itself is rolling and broken into narrow valleys where streams afford plentiful water supply, while to the west the land falls away into the low swampy lands of the Yazoo and Mississippi rivers. The State is very low, the highest altitude being but 1,000 feet. The coast has a shore line on the Gulf of Mexico of 88 miles, or including the irregularities and islands, of 287 miles. In the eastern part of the State the prairies are covered with grass the greatest part of the year. East of this prairie region extends a level but very fertile tract on the upper course of the Tombigbee River. In the northern district is a range of hills of moderate elevation, well-wooded but devoid of undergrowth. These hills find their western limit in the Walnut Hills; and west of them and between them and the Mississippi River, in about lat. 32° 30′, for a distance of more than 170 miles, north and south, and 60 miles extreme east and west, the country is occupied by immense bottom lands, produced and fed formerly by the inundations of the Mississippi, constituting the so-called «Delta.» Nearly all of this low region has been now reclaimed by a system of levees and is rapidly being opened up and settled, and penetrated by railroads. The bottom-lands are about 7,000 square miles in extent.

Rivers and Lakes.— Mississippi is well watered by the Homochitto, Big Black, Yazoo, Sunflower, Coldwater and Tallahatchie rivers, all emptying into the Mississippi, and the Pearl, Pascagoula, Leaf and Tombigbee, all emptying into the Gulf of Mexico. There are many small streams in all parts of the State, which, though inferior in capacity to those already noticed, are locally important, watering extensive districts and giving fertility to the soil. In the bottom lands are numerous lakes, bayous and channels, and in this district, along the Mississippi, levees are built by the State partly from a fund derived from a special tax on the land, and partly with moneys derived from the sale of swamp lands. Drainage districts in the Yazoo-Mississippi Delta have been recently established, one project alone calling for the expenditure of $8,000,000.

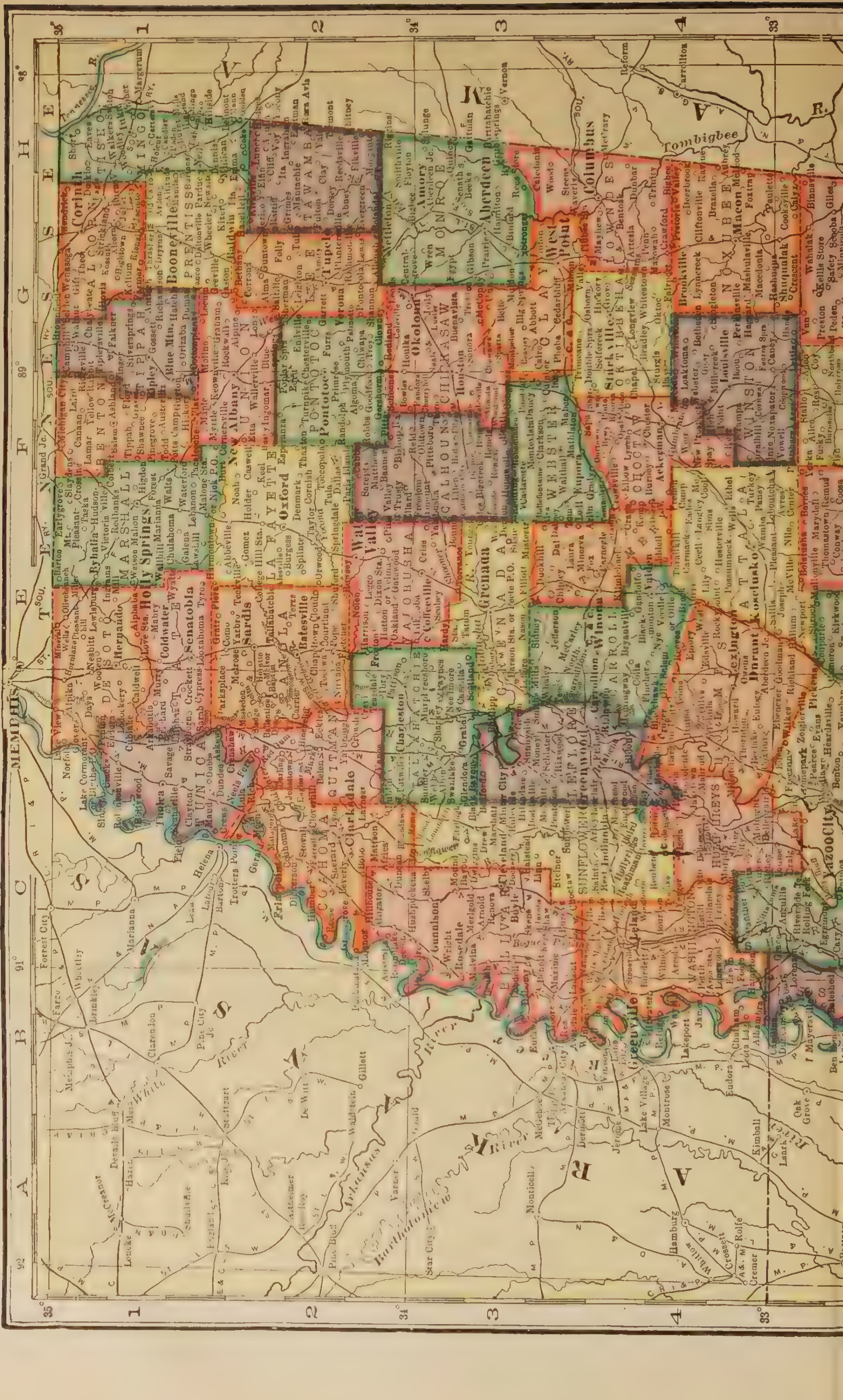
Climate.— The State lies in what is called the semi-tropic climate belt. The winters are short and mild, the mean temperature 45° F.; the summers are devoid of intense heat, the mean 81°, seldom reaching 100°. Ice from 1 to 2 inches thick forms in the northern part of the State. The elevation of the surface and the Gulf breezes render the climate delightful during most of the year. The annual rainfall ranges from 48 to 58 inches. The death rate is very low — 12.9 in 1,000. The heaviest rains occur in late winter or early spring, when the warm Gulf winds meet the cold north winds. The average wind velocity for the whole year is seven miles per hour. The prevailing wind for January is from the north, while it is from the south for July.

Geology.— Mississippi is occupied wholly by deposits of the Tertiary and Upper Secondary formations, which, sweeping around from the southern Atlantic States, attain here their greatest width. Near the Gulf of Mexico the sands and clays of the largest periods are spread over the country, and further north the deposits gradually become of greater age. At Vicksburg the Eocene appears at the base of the river bluffs and the upper portion of these is covered by a deep deposit of yellowish loam or loess, containing fresh-water and land shells. This extends over the country eastward and attains a thickness of 60 feet or more. The Upper Secondary appears near Jackson and occupies the northern portion of the State. Fossil remains of a gigantic marine animal, resembling the alligator, are found in the prairie regions.

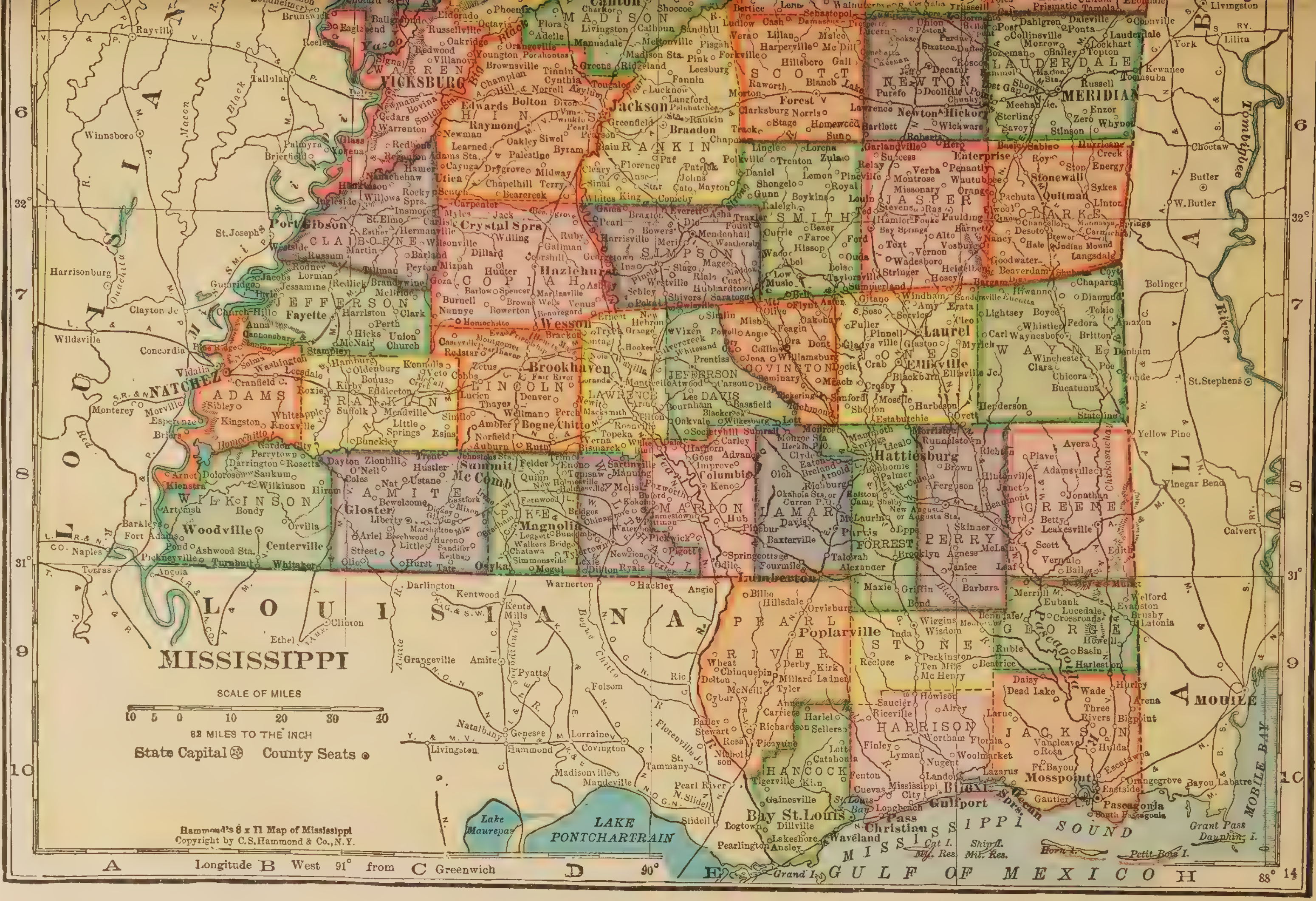
Flora and Fauna.— There are over 100 species of trees in the State, including 15 varieties of oak. There are cypress, poplar, long-leaved pine, tupelo, sycamore, persimmon, magnolia, holly, cucumber tree, sweet-gum, black-walnut and various species of hickory, elm and maple. Wild animals, such as the deer, puma, wolf, bear and wild-cat, are still occasionally

MISSISSIPPI

Abbeville, (E2)	235
Aberdeen, (H3)	4,071
Ackerman, (F4)	1,264
Acona, (D4)	150
Adair, (D4)	250
Agricultural College, (G4)	200
Albertson, (F7)	328
Alcorn, (B7)	200
Algoma. (F2)	202
Alligator, (C2)	263
Almadale, (D6)	100
Amory, (H3)	2,861
Anding, (D5)	150
Anguilla, (C5)	361
Arbo, (E7)	200
Arcadia, (B5)	100
Arcola, (C4)	453
Arkabutla, (D1)	168
Artesia, (G4)	583
Ashland, (F1)	190
Atlanta, (F3)	100
Austin, (D1)	105
Avera, (G8)	110
Bailey, (G6)	175
Baird, (C3)	234
Baldwyn, (G2)	922
Banks, (D1)	150
Banner, (F2)	116
Barlow, (C7)	46
Bassfield. (E8)	265
Batesville, (E2)	1,050
Battlefield, (G5)	100
Baxterville, (E8)	200
Bay St. Louis, (F10)	3,033
Bay Springs, (F7)	861
Beaumont, (G8)	250
Beauregard, (D7)	173
Beldon, (G2)	268
Belen, (D2)	148
Bellefontaine, (F3)	155
Belle Prairie, (D4)	230
Belmont, (H1)	459
Belzoni, (C4)	2,277
Benoit, (C3)	443
Benton, (D5)	200
Bentonia, (D5)	250
Berclair, (D4)	150
Beulah, (B3)	369
Bexley, (G9)	150
Bigbee, (H2)	100
Bigbee Valley, (H4)	100
Big Creek, (E2)	107
Biloxi, (G10)	10,937
Binnsville, (H5)	300
Black Hawk, (D4)	220
Blaine, (C3)	150
Blodgett, (F7)	415
Blue Lake, (D3)	200
Blue Mountain, (G1)	654
Blue Springs, (G2)	167
Bobo, (C2)	150
Bogue Chitto, (D8)	605
Bolivar, (B3)	120
Bolton, (D6)	494
Bond, (F9)	439
Bonhomie, (F8)	150
Booneville, (G1)	1,495
Booth, (C5)	125
Boyle, (C3)	702
Bradley, (G4)	100
Brandon, (E6)	691
Braxton, (D6)	237
Brookhaven, (D7)	4,706
Brooklyn, (F8)	200
Brookville, (G4)	854
Bucatunna, (G7)	421
Bude, (C8)	1,121
Buena Vista, (G3)	210
Burnsville, (H1)	363
Byhalia, (E1)	514
Byram, (D6)	125
Caledonia, (H3)	139
Calhoun City, (F3)	502
Camden, (E5)	170
Canton, (D5)	3,252
Carpenter, (C6)	150
Carriere, (E9)	800
Carrollton, (D4)	510
Carson, (E7)	150
Carthage, (E5)	635
Cary, (B5)	150
Cascilla, (D3)	161
Cato, (E6)	180
Cedar Bluff, (G3)	228
Centerville, (B8)	755
Chancy, (D2)	150
Charleston, (D2)	3,007
Cherry Creek, (F2)	100
Chester, (F4)	76
Chesterville, (G2)	130
Chotard, (C5)	100
Chulahoma, (E1)	100
Chunky, (F6)	272
Clarksburg, (E6)	100
Clarksdae, (D2)	7,552
Clarkson, (F3)	100
Claude, (E8)	100
Clayton, (C1)	150
Cleveland, (C3)	1,674
Cliftonville, (H4)	100
Clinton, (D6)	669
Cloverhill, (D2)	230
Clyde, (E8)	100
Coahoma, (C2)	326
Cockrum, (E1)	150
Coffeeville, (E3)	411
Cohay, (E7)	822
Coldwater, (E1)	856
Coles, (C8)	100
Collegehill, (E1)	125
Collins, (E7)	1,389
Colony Town, (D4)	150
Columbia, (E8)	2,826
Columbus, (H3)	10,501
Como, (E1)	818
Conehatta, (F6)	152
Conway, (E5)	100
Coral, (E8)	100
Corinth, (H1)	5,498
Cotton Plant, (G1)	110
Courtland, (E2)	265
Craig, (C5)	100
Crawford, (G4)	323
Crenshaw, (D2)	512
Crowder, (D2)	388
Cruger, (D4)	488
Crystal Sprs., (C7)	1,395
Cumberland, (F3)	170
Dahomy, (B3)	100
Daleville, (G5)	100
Dancy, (F3)	143
Darling, (D2)	150
Decatur, (F6)	319
Deeson, (C2)	100
Dekalb, (G5)	554
DeLisle, (F10)	100
Dennis, (H1)	217
Derma, (F3)	317
De Soto, (G7)	240
Dixon, (F5)	110
Dlo, (E7)	646
Doddsville, (D3)	200
Donavan, (G9)	100
Dorsey, (G2)	200
Dossville, (F5)	250
Drew, (C3)	721
Dry Grove, (C6)	250
Dubbs, (C1)	125
Dublin, (D2)	150
Duck Hill, (E3)	528
Duffee, (F5)	100
Dumas, (G1)	130
Duncan, (C2)	322
Duncansby, (B5)	180
Dundee, (D1)	250
Durant, (E4)	1,870
Eastside, (H10)	819
Ebenezer, (D5)	137
Ecru, (F2)	642
Eddiceton, (C8)	350
Eden, (D5)	221
Edinburg, (F5)	250
Edith, (H8)	100
Edwards, (C6)	727
Egypt, (G3)	61
Electric Mills, (G5)	600
Elizabeth, (B3)	110
Elliott, (E3)	89
Ellisville, (F7)	1,681
Endville, (G2)	150
Enid, (E2)	174
Enterprise, (G6)	700
Epley, (F8)	120
Epps, (F8)	100
Escatawpa, (G10)	125
Essex, (D2)	100
Estabutchie, (F8)	631
Ethel, (F4)	466
Eudora, (D1)	110
Eupora, (F3)	943
Evansville, (D1)	100
Fairport, (G4)	100
Fair River, (D7)	100
Falcon, (D2)	130
Falkner, (G1)	197
Fannin, (E6)	200
Farrell, (C2)	250
Fayette, (E7)	840
Fearns Springs, (G4)	130
Fenton, (E10)	125
Fentress, (F4)	67
Flora, (D5)	698
Florence, (D6)	207
Forest, (E6)	1,188
Fort Adams, (A8)	133
French Camps, (F4)	123
Friar Point, (C2)	954
Fulton, (H2)	227
Gallman, (D7)	176
Gandsi, (E7)	232
Garlandville, (F6)	100
Gattman, (H3)	151
Gautier, (G10)	100
Geeville, (G1)	120
Georgetown, (D6)	317
Gibson, (G3)	200
Gillsburg, (C8)	200
Gitano, (F7)	100
Glen Allen, (B4)	250
Glendora, (D3)	207
Gloster, (C8)	1,079
Gluckstadt, (D6)	100
Golden, (H1)	194
Good Hope, (E5)	200
Goodman, (E5)	589
Grace, (B4)	100
Grand Gulf, (B6)	200
Graysport, (E3)	150
Green Grove, (C2)	200
Greenville, (B4)	11,560
Greenwood, (D3)	7,793
Grenada, (E3)	3,402
Gulfport, (F10)	8,157
Gunnison, (C3)	485
Guntown, (G2)	365
Hamburg, (B7)	176
Hampton, (B4)	100
Handsboro, (G10)	809
Hardy Station, (E3)	166
Harperville, (E6)	179
Harriston, (C7)	258
Hattiesburg, (F8)	13,270
Hazlehurst, (D7)	1,762
Heidelberg, (G7)	489
Hermanville, (C7)	218
Hernando, (E1)	796
Hickory, (G6)	618
Hickory Flat, (F1)	269
Highlandale, (D3)	200
Highpoint, (F4)	145
Hillsboro, (E6)	180
Hinchcliff, (D2)	100
Hiwannee, (G7)	100
Holcomb, (D3)	205
Hollandale, (C4)	799
Holly Bluff, (B5)	105
Holly Ridge, (C4)	163
Holly Springs, (E1)	2,113
Hollywood, (D1)	500
Home Park, (D5)	150
Homesville, (D8)	150
Homewood, (F6)	100
Hopewell, (D6)	100
Horn Lake, (E1)	200
Houlka, (G2)	803
Houston, (F3)	1,408
Howard, (D4)	120
Howison, (F9)	250
Hub, (E8)	200
Hurley, (H9)	120
Increase, (G6)	160
Inda, (F9)	200
Independence, (E1)	108
Indianola, (C4)	2,112
Ingomar, (F2)	238
Inverness, (C4)	561
Isola, (C4)	616
Ittabena, (D4)	1,620
Iuka, (H1)	1,306
JACKSON, (D6)	22,817
Jacobs, (B7)	100
Jessie, (E5)	150
Johnstons Station, (C8)	293
Jonestown, (D2)	469
Kendrick, (H1)	100
Kilmichael, (E4)	395
Kiln, (F10)	150
Kipling, (G5)	200
Kirkville, (H2)	150
Knoxville, (B8)	110
Kola, (E7)	100
Kosciusko, (E4)	2,258
Kossuth, (G1)	247
Ladner, (F9)	130
Lafayette Springs, (F2)	153
Lake, (F6)	455
Lake Como, (F7	150
Lake Cormorant, (D1)	200
Lakeshore, (E10)	200
Lamar, (F1)	41
Lambert, (D2)	957
Landing, (C4)	130
Latonia, (H9)	200
Lauderdale, (H5)	187
Laurel, (F7)	13,037
Lawrence, (F6)	200
Leaf, (G8)	100
Leakesville, (G8)	555
Learned, (C6)	136
Leland, (C4)	2,003
Lena, (E5)	198



T E N N E S S E E
A R K A N S A S
MEMPHIS
Corinth
Holly Springs
Oxford
Tupelo
Aberdeen
Columbus
West Point
Starkville
Grenada
Greenville
Yazoo City
Kosciusko
Clarksdale
Batesville
New Albany
Booneville
Pontotoc
Okolona
Winona
Greenwood
Lexington
Louisville
Macon
Ripley
Senatobia
Coldwater
Hernando
Tunica
Helena
Arkansas City
Hamburg
Monticello
Pine Bluff
Tombigbee R.
Mississippi River
Arkansas River
White River
Bartholomew
ALCORN
TISHOMINGO
TIPPAH
BENTON
MARSHALL
DE SOTO
TATE
TUNICA
PANOLA
LAFAYETTE
UNION
PRENTISS
LEE
ITAWAMBA
PONTOTOC
CALHOUN
CHICKASAW
MONROE
LOWNDES
CLAY
OKTIBBEHA
NOXUBEE
WINSTON
CHOCTAW
WEBSTER
GRENADA
YALOBUSHA
TALLAHATCHIE
QUITMAN
COAHOMA
BOLIVAR
SUNFLOWER
LEFLORE
CARROLL
MONTGOMERY
ATTALA
HOLMES
HUMPHREYS
WASHINGTON
1
2
3
4
A
B
C
D
E
F
G
H
35°
34°
33°
92°
91°
90°
89°
88°


MISSISSIPPI
SCALE OF MILES
10 5 0 10 20 30 40
62 MILES TO THE INCH
State Capital ⊛ County Seats ●
Hammond's 8 x 11 Map of Mississippi
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A Longitude B West 91° from C Greenwich D 90° E
88° 14
6
7
8
9
10
32°
31°
LOUISIANA
ALABAMA
GULF OF MEXICO
MISSISSIPPI SOUND
MOBILE BAY
LAKE PONTCHARTRAIN
Lake Maurepas
Tombigbee River
MADISON
WARREN
HINDS
RANKIN
SCOTT
NEWTON
LAUDERDALE
CLAIBORNE
COPIAH
SIMPSON
SMITH
JASPER
CLARKE
JEFFERSON
LINCOLN
LAWRENCE
JEFFERSON DAVIS
COVINGTON
JONES
WAYNE
ADAMS
FRANKLIN
WILKINSON
AMITE
PIKE
WALTHALL
MARION
LAMAR
FORREST
PERRY
GREENE
PEARL RIVER
STONE
GEORGE
HARRISON
JACKSON
HANCOCK
Jackson
VICKSBURG
MERIDIAN
NATCHEZ
MOBILE
Hattiesburg
Laurel
Biloxi
Gulfport

MISSISSIPPI - Cont'd.

Leota Landing, (B4)	300
Lexington, (E4)	1,792
Liberty, (C8)	515
Little Springs, (C8)	200
Lizana, (F9)	100
Lockhart, (G6)	100
Logtown, (E10)	650
Long Beach, (F10)	980
Longtown, (D1)	250
Longview, (G4)	248
Lorena, (F6)	200
Lorenzen, (C5)	150
Lorraine, (F10)	100
Louin, (F6)	475
Louise, (D5)	537
Louisville, (F4)	1,777
Love, (E1)	100
Lucedale, (G9)	629
Lucien, (D7)	117
Ludow, (E5)	150
Lula, (D2)	344
Lumberton, (E9)	2,192
Lyman, (F10)	500
Lyon, (D2)	277
McCall Creek, (C7)	140
McComb, (C8)	7,775
McCool, (F4)	517
McHenry, (F9)	627
MaLain, (G8)	250
McLaurin, (F8)	250
McNair, (C7)	200
McNeill, (E9)	300
Maben, (F3)	499
Macon, (G4)	2,051
Madison Station, (D6)	450
Magee, (E7)	730
Magnolia, (D8)	2,012
Mantachie, (H2)	195
Mantee, (F3)	249
Marathon, (C4)	125
Marie, (C3)	100
Marietta, (H1)	116
Marion, (G6)	150
Marks, (D2)	1,020
Martin, (C7)	155
Mashulaville, (G4)	150
Matagorda, (C2)	100
Mathiston, (F3)	463
Mattson, (C2)	150
Mayersville, (B5)	155
Mayhew, (G4)	169
Meadville, (C8)	304
Meehan, Jc., (G6)	100
Mendenhall, (E7)	637
Meridan, (G6)	23,339
Merigold, (C3)	606
Merrill, (G9)	328
Michigan City, (F1)	48
Midnight, (D4)	200
Millard, (E9)	100
Miller, (E1)	150
Minter City, (D3)	600
Mish, (E7)	100
Mississippi City, (F10)	300
Mize, (E7)	332
Money, (D3)	125
Monroe, (C7)	110
Monticello, (D7)	464
Montpelier, (G3)	100
Montrose, (F6)	398
Moorhead, (D4)	1,600
Morgan City, (D4)	193
Morton, (E6)	437
Moselle, (F7)	240
Moss, (F7)	150
Moss Point, (G10)	3,340
Mound Bayou, (C3)	803
Mt. Carmel, (E7)	200
Mt. Olive, (E7)	778
Mt. Pleasant, (E1)	107
Muldon, (G3)	150
Myrtle, (F1)	325
Napanee, (C4)	150
Natchez, (B7)	12,608
Nesbitt, (E1)	142
Neshoba, (F5)	300
Nettleton, (G2)	653
New Albany, (F2)	2,531
New Augusta, (F8)	400
New Hebron, (D7)	237
Newton, (F6)	1,604
Nicholson, (E9)	348
Nola, (D7)	130
Norfield, (C8)	1,080
No. Carrollton, (E3)	363
No. Greenwood, (D3)	639
Noxapater, (F4)	515
Nugent, (F10)	100
Oakland, (E2)	429
Oakley, (C6)	125
Oak Vale, (E8)	228
Ocean Springs, (G10)	1,732
Ofahoma, (E5)	100
Okolona, (G2)	3,852
Olive Branch, (E1)	197
Oma, (D7)	100
Ora, (E7)	375
Orange Grove, (H10)	100
Orvisburg, (F9)	187
Osyka, (C8)	704
Ovett, (G8)	570
Owens Wells, (E4)	130
Oxford, (F2)	2,150
Pace, (C3)	100
Pachuta, (G6)	332
Paden, (H1)	250
Paris, (F2)	100
Pascagoula, (H10)	6,082
Pass Christian, (F10)	2,357
Pattison, (C7)	151
Paulding, (F6)	150
Paynes, (D2)	150
Pearlhaven, (D7)	87
Pearlington, (E10)	300
Pelahatchee, (E6)	1,212
Penton, (D1)	100
Percy, (C4)	200
Perkinston, (F9)	200
Perthshire, (C3)	400
Petal, (F7)	150
Pheba, (G3)	300
Philadelphia, (F5)	1,669
Philipp, (D3)	200
Picayune, (E9)	2,479
Pickens, (D5)	457
Pine Bur, (E8)	100
Pine Valley, (E2)	200
Pinola, (D7)	245
Pittsboro, (F3)	252
Plantersville, (G2)	275
Plattsburg, (E4)	100
Pleasant Hill, (E1)	190
Pocahontas, (D6)	130
Pontotoc, (F2)	1,274
Pope, (E2)	278
Poplar Springs, (G2)	27
Poplarville, (F9)	1,290
Port Gibson, (B7)	1,691
Potosi, (C5)	200
Potts Camp, (F1)	319
Prairie, (G3)	149
Prairie Point, (H4)	250
Prentiss, (E7)	458
Puckett, (E6)	100
Pulaski, (E6)	280
Purvis, (F8)	919
Quincy, (H3)	150
Quitman, (G6)	1,375
Raleigh, (E6)	210
Randolph, (F2)	137
Rara Avis, (H2)	150
Ratliff, (G1)	150
Raymond, (C6)	500
Recluse, (F9)	100
Reform, (F4)	69
Renalara, (C2)	125
Rich, (C1)	200
Richburg, (F8)	200
Richey, (C4)	100
Richton, (G8)	1,363
Ridgeland, (D6)	164
Rienzi, (G1)	493
Ripley, (F1)	856
Robinsonville, (D1)	300
Rockport, (D7)	150
Rodney, (B7)	251
Rolling Fork, (C5)	703
Rome, (C3)	400
Roseacres, (C2)	200
Rosedale, (C3)	1,696
Rose Hill, (G6)	300
Rosetta, (B8)	150
Roxie, (B8)	207
Ruleville, (D3)	1,022
Rural Hill, (F4)	150
Russum, (B7)	120
Sabougla, (F3)	150
Sallis, (E4)	273
Saltillo, (G2)	440
Sandersville, (G7)	559
Sandy Hook, (E8)	100
Sanford, (F8)	300
Sarah, (D1)	100
Saratoga, (E7)	150
Sardis, (E2)	1,352
Sarepta, (F2)	125
Satartia, (D5)	135
Saucier, (F9)	255
Schlater, (D3)	400
Scobey, (E3)	125
Scooba, (G5)	700
Seminary, (E7)	360
Senatobia, (E1)	1,126
Sessums, (G4)	100
Shannon, (G2)	489
Sharon, (E5)	150
Shaw, (C3)	1,375
Shelby, (C3)	1,300
Sherman, (G2)	421
Shiloh, (B5)	100
Shivers, (E7)	96
Shubuta, (G7)	912
Shuqualak, (G5)	764
Sidon, (D4)	370
Silver City, (C4)	322
Silver Creek, (E7)	252
Silver Springs, (G1)	100
Slate Spring, (F3)	155
Sledge, (D1)	275
Smithdale, (D8)	100
Smithville, (H2)	138
Sontag, (D7)	100
Soso, (F7)	142
So. Pascagoula, (H10)	350
Spanish Fort, (C5)	100
Springville, (F2)	100
Standing Pine, (E5)	200
Star, (D6)	260
Starkville, (G4)	2,596
State Line, (G8)	363
Stephenson, (B8)	528
Stewart, (F4)	196
Stonewall, (G6)	1,000
Stonington, (C7)	150
Stratton, (F5)	74
Strayhorn, (D1)	132
Stringer, (F7)	267
Strongs, (G3)	100
Sturgis, (F4)	354
Summerland, (F7)	100
Summit, (C8)	1,187
Sumner, (D3)	613
Sumrall, (E8)	1,444
Sunflower, (C3)	517
Sunnyside, (D3)	150
Sylvarena, (F6)	200
Taylor, (E2)	209
Taylorsville, (F7)	601
Tchula, (D4)	550
Tenmile, (F9)	200
Terry, (D6)	392
Thaxton, (F2)	155
Thornton, (D4)	64
Thrasher, (G1)	100
Tibbee Station, (G3)	100
Tilden, (H2)	100
Tillatoba, (E3)	193
Tishomingo, (H1)	273
Toccopola, (F2)	325
Tocowa, (E2)	72
Tomnolen, (F4)	199
Toomsuba, (H6)	300
Trenton, (E6)	200
Troy, (G2)	96
Tula, (F2)	178
Tunica, (D1)	955
Tupelo, (G2)	5,055
Tutwiler, (D2)	1,010
Tylertown, (D8)	1,116
Tyro, (E1)	100
Union, (F5)	1,012
Union Church, (C7)	150
Uriel, (G7)	100
Utica, (C6)	445
Vaiden, (E4)	579
Valley, (D5)	100
Vance, (D2)	180
Vancleave, (G9)	150
Vardaman, (F3)	599
Vaughan, (D5)	200
Verna, (D8)	100
Vernal, (G8)	200
Verona, (G2)	500
Vicksburg, (C6)	18,072
Vosburg, (G7)	200
Wahalak, (G5)	141
Waldo, (F5)	100
Wallfield, (F2)	100
Walls, (D1)	200
Walnut, (G1)	150
Walnut Grove, (F5)	199
Walthall, (F3)	114
Wanilla, (D7)	150
Washington, (B7)	100
Waterford, (F1)	130
Water Valley, (E2)	4,315
Waveland, (F10)	431
Waynesboro, (G7)	689
Weathersby, (E7)	180
Webb, (D3)	553
Weilerman, (B4)	200
Weir, (F4)	377
Wesson, (D7)	885
West, (E4)	236
W. Point (G3)	4,400
Wheeler, (G1)	222
Whitesand, (E7)	150
Wiggins, (F9)	1,037
Winborn, (F1)	150
Winchester, (G7)	150
Winona, (E4)	2,572
Winterville, (B4)	150
Wisdom, (G9)	100
Woodland, (F3)	194
Woodville, (B8)	1,012
Wren, (G3)	100
Yazoo City, (C5)	5,244
Zama, (F5)	427
Zion, (F5)	150
Zion Hill, (C8)	500

seen. Alligators are found in the Mississippi River as far north as the mouth of the Arkansas, and in some of the smaller rivers; and most of the streams abound in fish. Paroquets are seen as far north as Natchez and wild turkeys are still somewhat common.

Forestry.— There are about 32,000 square miles of timbered land in the State. The yellow pine ranks first among the forest trees, and extends northward from the coast for 150 miles. The hills or bluffs along the Mississippi Delta extend to the prairie lands on the eastward and afford numerous forests of oak, gum, poplar, tulip, ash, maple and hickory, and a few pine trees. The prairies of the southern part are covered with the long-leafed pine. Only within recent years has the timber product been important. Nearly all the timber cut consists of yellow pine and oak and other hard woods. Turpentine, resin and other naval stores are no small portion of the product from the timber belt.

Agriculture.— The fertility of the soil and a favorable climate give to Mississippi eminent advantages as an agricultural State. Nowhere in the world are there better alluvial lands than the Mississippi bottom or «Delta» contains — an alluvial plain in a mild climate, level as the surface of the ocean and of inexhaustible fertility; and this plain is only a small part of the fertile lands of the State. The table-lands of the north, the loams along the bluffs and banks of the Mississippi, the dark and heavy prairie lands of the northeastern section and the inland bottoms are of scarcely less fertility. The prairies, especially in the Tombigbee district, furnish excellent pasturage and, besides the common crops, produce fine alfalfa. Sugar is produced in the southern portion, besides molasses, but cotton and cotton-seed form the great staple of practically the entire State. Maize and oats are grown everywhere and wheat of fine quality is sometimes, though not commonly, produced in the northern parts. All the fruits of temperate climes grow in perfection, including berries and melons; plums, peaches and figs are abundant and, in the southern part, oranges and pecans. The farms of Mississippi, according to latest reliable statistics, numbered 272,101 (average size 66.9 acres), total acreage 18,196,979 acres, of which 9,325,677 acres were improved land, valued at $964,751,855. Of this, $641,842,394 was the value of land, $148,054,384 was the value of buildings, $39,881,256 of implements and machinery and $134,973,821 of domestic animals, poultry and bees. Of the farmers 110,279 were native-born whites, 603 were foreign-born whites, 161,001 were negroes, and 218 Indians. Of the whites, 68,131 were owners, 41,954 were tenants and 797 managers; of the non-whites, 23,179 were owners, 137,848 were tenants and 192 managers.

The principal crops with their acreage, production and value in 1922 were: Corn 2,918,000 acres, 51,065,000 bushels, valued at $43,405,000; winter wheat, 5,000 acres, 60,000 bushels valued at $87,000; clover seed, 20,000 acres, 120,000 bushels, valued at $1,200,000; oats, 140,000 acres, 2,650,000 bushels, valued at $1,756,000; tame hay, 428,000 acres, 550,000 tons, valued at $7,975,000; sorghum sirup, 42,000 acres, 3,696,000 gallons, valued at $1,700,000; rice, 1,000 acres, 19,000 bushels, valued at $21,000; potatoes, 16,000 acres, 1,360,000 bushels, valued at $2,176,000; sweet potatoes, 109,000 acres, 11,445,000 bushels, valued at $7,897,000; cotton, 3,078,000 acres, 1,010,000 bales, valued at $121,705,000; peanuts, 18,000 acres, 12,150,000 pounds, valued at $729,000; apples, 216,000 bushels, peaches, 375,000 bushels, and pears 190,000 bushels.

The total value of Mississippi crops for 1920 was $336,207,156, including fruits, nuts, and vegetables from approximately 6,359,385 acres harvested. Cereal crops had a value of $71,484,048, while the miscellaneous crops — tobacco, cotton, sorghum sirup, sugar cane, broom corn, chufas, hemp and ginseng had a value of $218,455.355. Hay and forage crops had a value of $14,744,951.

The total value of livestock on farms and ranges in 1920 was $128,263,062, of which $39,950,140 represented the value of cattle, 22,921,665 horses, 49,298,584 mules, 14,703,650 swine and the rest asses, burros, goats and sheep. Of the cattle, $26,190,875 represented the value of dairy cows.

POULTRY AND BEES ON FARMS, 1920

ITEM	Farms reporting	Number reported	Value
Chickens	237,646	6,342,204	$5,927,043
Turkeys	19,876	80,236	274,545
Ducks	7,230	30,807	28,845
Geese	18,779	118,194	157,036
Guinea fowls	20,788	111,435	72,279
Pigeons	1,193	15,970	5,702
Total poultry	237,656	6,698,846	$6,465,450
Hives of bees	17,221	82,770	$245,309

In 1923 the State had 211,000 horses, 302,000 mules, 541,000 milch cows, 677,000 other cattle, 142,000 sheep and 1,207,000 hogs.

Many counties are pressing vigorously the work of tick eradication and more than two-thirds of the territory of the State is now freed from that pest and from the Federal quarantine on cattle shipments. The value of the fruit product of the State in 1920 was $1,488,828, of this amount over 20 per cent was contributed by the peach crop; 13 per cent by apples, and 2.5 per cent by figs and 0.1 by oranges.

Fisheries.— This industry is centred at Biloxi, from which great quantities of oysters and shrimps are shipped annually. Buffalo fish, mullet, catfish, sea trout are the principal fishes sought. About 2,000 persons are engaged in the industry in which is invested capital to the extent of over $500,000. The value of the annual catch is about $550,000.

Minerals.—Mississippi is not a mining State. Clay is the principal product, being produced annually to the value of about $800,000. Marl, phosphate rock, hydraulic lime, gypsum and lignite are also found in limited quantities. None of these is worked to any considerable extent. There are six mineral springs which in a recent year produced 257,200 gallons, valued at $52,780.

Manufactures.— At the last industrial census, measured by the value of products of its manufacturing industries ($197,746,987), Mississippi ranked 34th among the States and with an average of 57,560 wage-earners engaged in its industries, the State ranked 32d in this respect. The census reported 2,455 industrial establishments, employing 64,452 persons, of whom 2,811 were proprietors and firm members; 4,081 salaried employees and 57,560 wage-earners. The primary horse-power required to operate these establishments aggregated 200,814; the capital amounted to $154,117,337; the cost of material aggregated $96,677,871; the value of products $197,746,987, making the value added by manufacture $101,069,116. Of the latter sum only $51,255,716 was paid in wages and $7,926,819 in salaries, or an average of $890 per annum for each wage-earner, leaving about $41,000,000 for rent and taxes, payments for contract work, interest on investment, depreciation, and other charges. The table below shows the relative importance of the leading manufacturing industries.

Of the 64,452 persons engaged in manufacturing industries, of whom 57,560 were wage-earners, as already stated, 57,080 were 16 years of age and over and 480 under 16 years; 2,967 were women and girls and 141 of the latter were under 16 years of age. Consult ‘Census of Manufactures’ (Vol. IX, issued by Department of Commerce, Bureau of the Census, Washington, D. C., 1923).

INDUSTRY	No. of establishments	Wage earners	Value of products	Value added by manufacture
Lumber and timber products	1,435	35,512	$87,508,000	$61,063,000
Oil and cake, cottonseed	49	2,454	39,202,000	5,461,000
Cars and shop construction	13	4,030	10,226,000	6,167,000
Cotton goods	15	2,406	8,067,000	3,093,000
Lumber and planing mill products	65	1,102	5,933,000	2,445,000
Turpentine and rosin	45	2,495	5,548,000	4,257,000
Fertilizers	9	370	3,627,000	959,000
Mineral and carbonated waters	68	440	3,333,000	1,624,000
Butter	19	106	2,248,000	353,000
Bread and other bakery products	82	295	2,189,000	739,000
Flour mill and grist mill products	54	61	2,092,000	195,000
Foundry and machine-shop products	43	460	1,786,000	935,000
Food preparations, not otherwise specified	7	81	1,684,000	260,000
Ice, manufactured	50	447	1,515,000	946,000
Printing and publishing, newspapers and periodicals	156	412	1,348,000	1,030,000
Confectionery and ice cream	21	158	1,211,000	505,000
Wood preserving	4	206	1,184,000	493,000
Boxes, wooden packing, except cigar boxes	4	821	1,059,000	543,000
Shipbuilding	9	248	1,028,000	610,000
Carriages and wagons	14	187	933,000	557,000
Brick, sewer pipe and drain tile	28	472	925,000	633,000
Fish canning and preserving	11	481	882,000	256,000
All industries	2,455	57,560	$197,747,000	$101,069,000

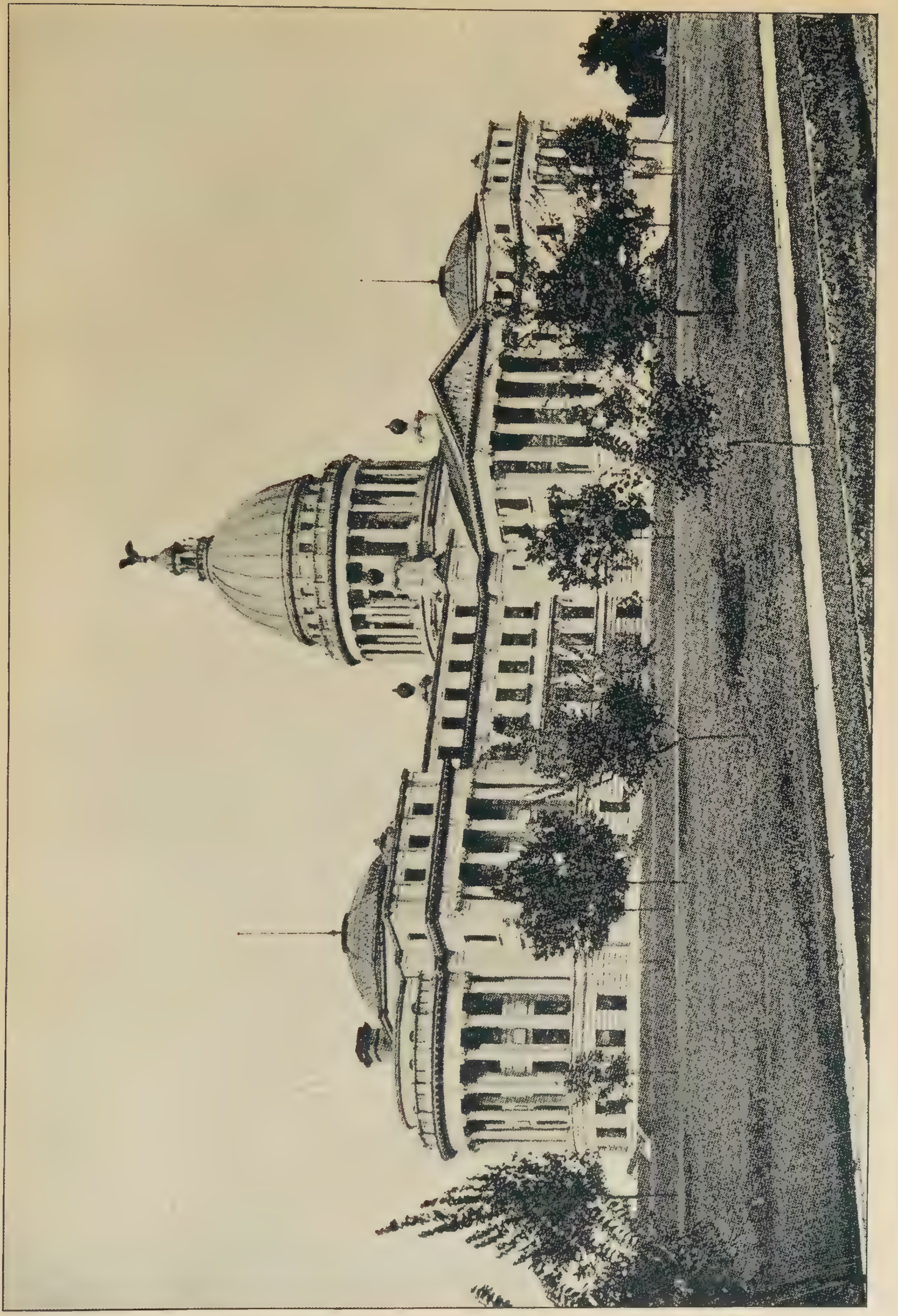
Finances.—The total bonded debt as of 1 May 1922 was $13,446,500. The assessed valuation in 1917 was as follows: Real estate, $417,164,293; personal property, $117,551,983; public service corporations, $91,580,335: total, $626,296,611; and in 1922 the total assessment was $765,198,435. The total receipts for the year 1921–22 were $14,904,874, total disbursements, $13,449,340.

Banks and Banking.—The first bank in the State was opened in Natchez in 1809. On 15 Sept. 1922, there were 32 national banks, in operation with $41,867,000 of deposits, including savings deposits; and 319 State banks with $112,202,000 of deposits, including over $8,000,000 of savings accounts. A comparative statement of the State banks, not including national banks, is: On 30 June 1900, resources, $19,345,840; on 25 Aug. 1905, $50,620,811; on 2 June 1910, $66,688,649; on 30 June 1922, $146,927,000. In this State the Uniform Negotiable Instruments Act has been adopted.

Education.— Nearly all the cities and towns in the State maintain graded schools for 10 months in the year. The country free schools are maintained four months. Separate schools are conducted for the two races. In 1920 the children of school age numbered 698,264; the enrolment in public schools was 432,625, and the average daily attendance was 80.1 per cent. There were 11,611 licensed teachers in the public schools in 1922, and 540,756 pupils. The State appropriation for common schools in 1922 was $3,400,000, in addition to which the counties and the towns levy additional taxes for schools, and there are other sources of public revenue for schools. For higher education, there were 172 public high schools, private secondary schools, public and private normal schools, universities and colleges for men and colleges for women. The men's colleges include the Agricultural and Mechanical College (State) at Starkville; the Mississippi College (Baptist) at Clinton; Millsaps College (Methodist) at Jackson; Jefferson College (at Washington) near Natchez; Chamberlain-Hunt (Presbyterian), Port Gibson; Rust University at Holly Springs. Among the most notable women's colleges are the Industrial Institute and College (State) at Columbus; Blue Mountain College (Baptist) at Blue Mountain; East Mississippi Female College (Methodist) at Meridian; Belhaven College (Presbyterian) at Jackson; Hillman College (Baptist) at Clinton; Whitworth College (Methodist) at Brookhaven; Grenada College (Methodist) at Grenada; Stanton College at Natchez. The University of Mississippi at Oxford is a coeducational institution, as also the Alcorn Agricultural and Mechanical College at Rodney, a State technological institute for colored pupils; also the Tougaloo University, a Baptist missionary industrial institution, at Tougaloo, near Jackson. Normal schools are established at various points.

Religion.— The Baptist Church claims over half of the church population of the State; and then follow the Methodist Episcopal, South; the African Methodist, the Methodist Episcopal, the Roman Catholic, the Southern Presbyterian, the Cumberland Presbyterian, the Disciples of Christ and the Protestant Episcopal.

Charities and Correction.—There is a State penitentiary, the prisoners being employed at labor on State farms. There are State hospitals for the insane at Asylum and Meridian. The State Deaf and Dumb Institute, for white and colored, and the School for the Blind (white) are located at Jackson. The Beauvoir



State Capitol at Jackson

Home is located at Beauvoir. There are charity hospitals supported by the State at Jackson, Natchez and Vicksburg. There are altogether 17 benevolent institutions, of which about 12 have been founded by private or church authorities. At present there are about 435 paupers in institutions, being 24.3 per 100,000 population, and about 2,300 prisoners in penal institutions, being 127 per 100,000 of the population.

Government.— The State is governed under a constitution adopted in 1890, with some later amendments. The governor is elected for a term of four years, and receives a salary of $5,000 per annum. He is not eligible for re-election. Other executive officers are the lieutenant-governor, auditor, attorney-general, secretary of state and treasurer. Legislative sessions are held biennially, beginning on Tuesday after the first Monday in January; but only those sessions held in the leap years are unlimited as to scope and duration; the other sessions can deal only with revenue and appropriations and such other matters as the governor shall submit to them by message. The legislature and entire State government are Democratic. Each member receives $400 per annum and mileage. There are eight representatives in the United States Congress. The legislature is composed of 138 representatives and 45 senators. There are six supreme judges, elected by the people for eight years; and circuit judges and chancery judges, also elected by the people for four years. Voters must have resided in the State for two years and in the election district for one year. Registration is necessary, and the voter must be able to read any section of the Constitution of the State, or be able to understand the same when read to him, or give a reasonable interpretation thereof. He must also have paid taxes for two years and must pay a poll tax of $2 for school maintenance.

State and county officials are nominated at primary elections, the expenses being paid by the political parties interested. The commission form of government is permitted to municipalities, which enjoy a large measure of home rule. The initiative and referendum is allowed in municipal charters and is called into operation by petition of 10 per cent of the voters. A commission charter may be abandoned by any city by a vote of the electors after it has been six years in operation. Among the special statutory provisions is one according to which a public service corporation forfeits its charter for intrastate commerce in case it removes a suit from the State to the Federal courts. Contributory negligence is not recognized as a bar to a suit for damages for injuries, etc. Women may make contracts and dispose of or acquire property on equal terms with their husbands.

Transportation.— The total length of railroads within the State in 1922 was 4,447 miles; besides 97 miles of electric interurban railways. The most important lines were, the Yazoo and Mississippi Valley, having 1,143 miles within the State; the Illinois Central, 679 miles; the Gulf and Ship Island, 305 miles; the Kansas City, Memphis and Birmingham, 143 miles; the Mobile and Ohio, 315 miles; the Southern, 377 miles; the Alabama and Vicksburg, 141 miles; the Louisville and Nashville, 74 miles; the New Orleans and Northeastern, 153 miles; the New Orleans and Great Northern, 106 miles; the Mobile, Jackson and Kansas City, 370 miles; and the Mississippi Central, 164 miles. Vicksburg, Greenville and Natchez are the principal ports on the Mississippi River; and Gulfport, Biloxi and Pascagoula, on the Gulf of Mexico. The various counties are spending a great deal of money improving the roads by graveling to the extent of many hundreds of miles in the aggregate.

Population.— The total population in 1920 was 1,790,618 giving the State 23rd rank in population. Of this number 853,962 were whites and 935,184 were colored; 1,253 were Indians and 263 Asiatics. There were 8,019 foreign-born inhabitants, of whom 929 were Germans, 1,841 Italians and 412 Irish. Until 1830 and later, the white population was somewhat in excess of the colored; but in the decade 1830 to 1840 the cessions of Indian Territory within the State made by the Chickasaw and Cherokee Indians, and the opening for occupancy of the lands so ceded, constituting more than half the State, invited an immediate and immense inflow of settlers, with very many slaves because of the fine cotton lands. the colored population at once ran over the white, and it has so remained since. The history is shown by this table:

YEARS	Whites	Free colored	Slaves	Total
1800...........	5,179	182	3,489	8,850
1810...........	23,024	240	17,088	40,352
1820...........	42,176	458	32,814	75,448
1830...........	70,443	519	65,659	136,621
1840...........	179,074	1,366	195,211	375,651
1850...........	295,718	930	309,878	606,326

The total population in 1860 was 791,305; in 1870 was 827,922; in 1880 was 1,131,597; in 1890 was 1,289,660; in 1900 was 1,551,270; in 1910 was 1,797,114; in 1920 was 1,790,618. The largest cities are Meridian, 23,399; Jackson, 22,817; Vicksburg, 17,931; Natchez, 12,608. Other important towns are Hattiesburg, Greenville, Laurel, Biloxi, Yazoo City, Gulfport and McComb City.

History.— Hernando de Soto (q.v.) and his companions first visited the Mississippi region in 1539. They made no settlements, however, and the death of the leader in 1542 put an end to the expedition. In 1682 La Salle descended the Mississippi, took formal possession of the adjacent country for the king of France and called it Louisiana. In 1698 M. d'Iberville was authorized by the French king to colonize the regions of the lower Mississippi. He landed near Ship Island and, from this point, setting out with two large barges, explored the coast, discovered the mouth of the Mississippi, reaching the bend at the mouth of the Red River, and returning to Ship Island erected a fort at the Bay of Biloxi, about 80 miles east from the site of New Orleans. He then embarked for France, leaving the fort in command of his two brothers, Sauvolle and Bienville. In December 1699, Iberville returned, and soon after built a fort on the banks of the Mississippi. In 1700 the Chevalier de Tonty arrived at Iberville's fort with a party of Canadian French from Illinois. Availing himself of de Tonty's knowledge of the country, Iberville dispatched a party under his lead to explore the river and its banks. They ascended to the Natchez country, 400 miles above the French fort, and here selected a site for a fort and called it Rosalie. A settlement was also made in 1703 on the Yazoo River, which was called Saint Peter's. The colonies thus planted grew but slowly, and New Orleans, being founded soon after, drew off a large portion of the colonists from the interior, besides attracting the new immigrants. In 1728 the settlers and the Natchez Indians became enemies and, as a result, the latter massacred the settlers, and over 200 persons were killed and 500 taken prisoners. The captives were, however, released, and new and stronger forts were erected. Aided by the Choctaw tribes, the French succeeded in destroying the tribe, the greater part of which fell in battle. In 1733 the colony went to war with the Chickasaws, allies of the English, and the conflict continued for several years. There was a peace, followed in 1752 by another Indian war. In 1762 when Florida was ceded to Great Britain, that part of the present State lying south of a line drawn eastward from the mouth of the Yazoo River (practically from Vicksburg) was claimed to be part of Florida; and when in 1781 Spain conquered Florida, that part of the State came under Spanish rule. In 1798 the Mississippi Territory was created by Congress. Its boundaries were the Mississippi River on the west, the 31st parallel on the south, the Chattahoochee on the east and a line drawn from the mouth of the Yazoo due east on the north. The Territory having been surrendered to the United States as part of Georgia, the consent of that State had been previously obtained to the establishment of a territorial government. This consent was followed in 1802 by the further cession by Georgia of all her lands south of Tennessee, and these by an act of Congress in 1804 were attached to the Mississippi Territory, which thus comprised the whole of what are now the States of Alabama and Mississippi from the 31st to the 35th parallel. The territory between the Pearl and the Perdido rivers was added in 1811, having been wrested from Spain under the plea that it had originally formed a part of Louisiana. In March 1817, Alabama was separated from Mississippi and organized under a territorial government of its own; and on 10 December of the same year Mississippi was admitted into the Union as an independent State. In 1861 it passed an ordinance of secession, took a prominent part in the Civil War, and finally, in January 1869, was readmitted to representation in Congress, after ratifying the 15th amendment. The principal battles fought here during the Civil War were those of Corinth, Baker's Creek, Holly Springs, Iuka and the siege of Vicksburg. The several State constitutions have been those of 1817, 1832, 1869 and 1890; the latter, with certain amendments, being now in force. The State has had four territorial governors, two provisional governors, one Union Democrat, three Republican and 30 Democratic governors.

GOVERNORS OF MISSISSIPPI

	TERRITORIAL	
Winthrop Sargent		7 May 1798
William C. C. Claiborne	(Recess appointment)	25 May 1801
William C. C. Claiborne	(Appointed on confirmation)	26 Jan. 1802
Robert Williams	(Appointed on confirmation)	1 March 1805
Robert Williams	(Appointed on confirmation)	14 March 1808
David Holmes	(Appointed on confirmation)	7 March 1809
David Holmes	(Appointed on confirmation)	31 March 1812
David Holmes	(Appointed on confirmation)	10 Dec. 1814
	STATE	
David Holmes	Democrat-Republican	7 Oct. 1817, to 5 Jan. 1820
George Poindexter	Democrat	5 Jan. 1820 to 7 Jan. 1822
Walter Leake	"	7 Jan. 1822, to 17 Nov. 1825
Gerard C. Brandon [1]*	"	17 Nov. 1825, to 7 Jan. 1826
David Holmes	"	7 Jan. to 25 July 1826
Gerard C. Brandon [2]	"	25 July 1826, to 9 Jan. 1832
Abram M. Scott [3]	"	9 Jan. 1832, to 12 June 1833
Charles Lynch	"	12 June to 20 Nov. 1833
Hiram G. Runnels	"	20 Nov. 1833, to 20 Nov. 1835
John A. Quitman [4]	Whig	3 Dec. 1835, to 7 Jan. 1836
Charles Lynch	Democrat	7 Jan. 1836, to 8 Jan. 1838
Alexander G. McNutt	"	8 Jan. 1838, to 10 Jan. 1842
Tilghman M. Tucker	"	10 Jan. 1842, to 10 Jan. 1844
Albert G. Brown	"	10 Jan. 1844, to 10 Jan. 1848
Joseph W. Matthews	"	10 Jan. 1848, to 10 Jan. 1850
John A. Quitman	"	10 Jan. 1850, to 3 Feb. 1851
John I. Guion [5]	"	3 Feb. to 4 Nov. 1851
James Whitfield [6]	"	24 Nov. 1851, to 10 Jan. 1852
Henry S. Foote	Union-Democrat	10 Jan. 1852, to 5 Jan. 1854
John J. Pettus [7]	Democrat	5 Jan. to 10 Jan. 1854
John J. McRae	"	10 Jan. 1854, to 16 Nov. 1857
Wm. McWillie	"	16 Nov. 1857, to 21 Nov. 1859
John J. Pettus	"	21 Nov. 1859, to 16 Nov. 1863
Charles Clark	"	16 Nov. 1863, to 22 May 1865
William L. Sharkey [8]	"	June to 16 Oct. 1865
Benjamin G. Humphreys	"	16 Oct. 1865, to 15 June 1868
Adelbert Ames [9]	Provisional	15 June 1868, to 10 Mar. 1870
James L. Alcorn	Republican	10 Mar. 1870, to 30 Nov. 1871
Ridgley C. Powers [10]	"	30 Nov. 1871, to 4 Jan. 1874
Adelbert Ames	"	4 Jan. 1874, to 29 Mar. 1876
John M. Stone [11]	Democrat	20 Mar. 1876, to 9 Jan. 1882
Robert Lowry	"	9 Jan. 1882, to 13 Jan. 1890
John M. Stone	"	13 Jan. 1890, to 20 Jan. 1896
Anslem J. McLaurin	"	20 Jan. 1896, to 16 Jan. 1900
Andrew H. Longino	"	16 Jan. 1900, to 19 Jan. 1904
James Kimble Vardaman	"	19 Jan. 1904, to 21 Jan. 1908
Edmond Favor Noel	"	21 Jan. 1908, to 16 Jan. 1912
Earl LeRoy Brewer	"	16 Jan. 1912, to 18 Jan. 1916
Theodore Gilmore Bilbo	"	18 Jan. 1916, to — Jan. 1920
Loe M. Russell	"	— Jan. 1920 to —

* For references see next page.

Bibliography.— Claiborne, ‘Mississippi as a Province, Territory and State’ (1889); Davis, ‘Recollections of Mississippi’ (1889); Duval, ‘History of Mississippi’ (1892); Garner, ‘Reconstruction in Mississippi’ (1901); Goodspeed, ‘Memoir of Mississippi’ (1891); Hurt, ‘Mississippi, Its Climate, Soil and Production’ (1883); Hilgard, ‘Report on the Geology and Agriculture of Mississippi’ (1860); Lowry and McCardle, ‘History of Mississippi’ (1891); Monette, ‘History of Mississippi Valley’ (1848); Mayes, ‘Educational History of Mississippi’ (1891); Rozier, ‘History of Early

Settlements in the Mississippi Valley› (1890); Tracy, ‹Mississippi as It Is› (1895); Wall, ‹The State of Mississippi› (1879); Winsor, ‹The Mississippi Basin› (1895); ‹Publications of the Mississippi Historical Society› (16 vols.); Rowland, ‹Encyclopædia of Mississippi History› (2 vols., 1907); Reports of the Executive Departments of the State; Rowland, ‹Official and Statistical Register of the State of Mississippi› (Centennial ed., Madison, Wis., 1917).

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[1] Governor Leake died 17 Nov. 1825, and was succeeded by Lieutenant-Governor Brandon.

[2] Governor Holmes resigned in July 1826, and was succeeded by Lieutenant-Governor Brandon.

[3] Governor Scott died 12 June 1833, and was succeeded by Charles Lynch, president of the senate.

[4] Governor Runnels vacated the executive office 20 Nov. 1835, and was succeeded by John A. Quitman, president of the senate.

[5] Governor Quitman resigned 3 Feb. 1851, and was succeeded by John I. Guion, president of the senate.

[6] Governor Guion's term as senator expired 3 Nov. 1851. The senate met 25 November and elected James Whitfield, president, who served as Governor until 10 Jan. 1852.

[7] Governor Foote resigned 5 Jan. 1854, and was succeeded by John J. Pettus, president of the senate.

[8] Governor Clark was removed by Federal soldiers 22 May 1865, and was succeeded by Judge William L. Sharkey as provisional governor by appointment of President Johnson.

[9] Governor Humphreys was removed by Federal soldiers 15 June 1868, and was succeeded by Adelbert Ames as military governor.

[10] Governor Alcorn resigned 30 Nov. 1871, and was succeeded by Lieutenant-Governor Powers.

[11] Governor Ames resigned 20 March 1876, and was succeeded by John M. Stone, president of the senate, the lieutenant-governor having been impeached.

EDWARD MAYES,
Author of ‹Educational History of Mississippi.›

MISSISSIPPI, University of, at New Oxford, Miss., was chartered 23 Feb. 1844, and the Lyceum building, two dormitories and residences for four professors, built from the plans of William Nicholl, elected supervising architect, were ready for the opening of the first session which took place 6 Nov. 1848, with a faculty of four members and 50 students. From its opening until 1880 the university was maintained by annual appropriations made by the legislature. In 1856 a special appropriation of $100,000, to be paid in five yearly instalments, was made by the legislature and with the aid of this the university made its first large growth in facilities and equipment. Since then commensurate with the growth of the institution the legislature has provided the necessary funds. The departments besides the collegiate comprise governmental science, law, engineering, pedagogy, medicine and pharmacy. The liberal appropriations made by the legislature have enabled the university to enlarge its facilities with fine new buildings, including a commodious dormitory for women students, who were welcomed to the university courses upon equal conditions with men in 1882, and a new library building, in part a gift from Andrew Carnegie, erected in 1911. The tuition fees are $60; annual living expenses amount to $130. The faculty now numbers 30; the average annual attendance of students is 400. From its inception to 1917 the number of graduates was 2,200, of whom 1,700 were living; during the World War, 1914–18, 400 of the students were enrolled with the colors.

MISSISSIPPI AGRICULTURAL AND MECHANICAL COLLEGE, founded in 1880, at Agricultural College, Miss. The regular four years' courses offered are the agricultural, mechanical and textile, leading to the degree of B.S.; a short course (10 weeks for two years) is given in the winter; graduate courses are also provided; and there is a preparatory department. Women are admitted to all courses. The experiment station is connected with the college, and receives special Federal appropriation; and farmers' institutes are organized by the college and attended by members of the faculty; in 1910 such institutes had an attendance of 2,000. The college was endowed by the Federal land grants of 1862 and 1890, and receives also State and Federal appropriations; no tuition is charged to residents of the State. Military instruction is given. In 1918 the students numbered 1,207; the instructors, 72; and the library contained about 36,200 volumes.

MISSISSIPPI BUBBLE, a celebrated financial scheme projected by John Law (q.v.) at Paris in 1717. Law issued shares for a vast company to be called the Compagnie d'Occident, and to be engaged in the colonization and cultivation of the banks of the Mississippi. Reports skilfully spread as to gold and silver mines discovered in these parts raised in the people the hope of great gains. The company soon absorbed those of the Senegal and the East Indies, and took the new title Compagnie des Indes. Such were the hopes raised by this undertaking that the shares originally issued at $100 were sold at 10, 20, 30 and 40 times their value. Law had promised to the regent that he would extinguish the public debt. To keep his word he required that the shares in this company should be paid for one-fourth in coin and three-fourths in *billets d'état* or public securities, which rapidly rose in value on account of the foolish demand which was created for them. In October 1719 the shares mounted as high as $4,000. The state took advantage of the popular frenzy to issue increased quantities of paper money, which was readily accepted by the public creditors and invested in shares of the Compagnie des Indes. This went on till the value of the paper money in circulation was more than three milliards, while the value of coined money was no more than 700,000,000. Before this stage was reached Law himself who had originated the idea of paper money had endeavored to check the issue but his efforts were unavailing. A catastrophe was now inevitable. About the end of 1719 the more prudent speculators began to sell out. In payment of their shares they received, of course, in great part, *billets d'état,* and with these bought gold, silver, diamonds, lands or anything else having a real value. As the *billets* became depreciated such articles as tallow, soap, etc., were often bought at fabulous prices. Law struggled desperately against the fall in the value of these shares, but all his devices to check their downward course were futile or had only a temporary success, and when the state finally declared that it would receive no further payments in paper, he perceived that all attempts to bolster up the scheme were in vain, and made his escape from France (December 1720). The affairs of the company were wound up by the state acknowledging itself debtor to the creditors of the company to the amount of $340,000,000. The public debt was augmented by $2,600,000 of «annual rentes.»

MISSISSIPPI CATFISH (*Ictalurus furcatus*, or *Ictalurus ponderosus*), the largest of American catfish (so called from the purring sound it makes when taken out of the water). It is chiefly found in the Mississippi River, but it also inhabits the Great Lakes, the larger waters of the Saskatchewan and the Missouri valleys. In color it is greenish slate with paler sides. The fish grows darker as it ages. The flesh is firm, flaky and of fine flavor. The fish sometimes reaches 150 pounds in weight. It spawns in April or May. It is caught with a hook and prefers live bait. It is called «mud cat» and «flannel mouth» in the South.

MISSISSIPPI COLLEGE, Clinton, Mass., founded in 1826 under the auspices of the Presbyterian Church, came under control of the Baptists in 1850. It has an academy and collegiate department. The college courses lead to the degrees of B.A., B.S and M.A. In 1915 the school had 17 professors and instructors, and 430 students. The library had 5,000 volumes. The property was valued at $405,000, exclusive of the productive fund of $130,000. The annual income is $25,000.

MISSISSIPPI RIVER (Ind. *Missi Sepe*, «father of waters,» «great river»), the main stem of the greatest drainage system of North America, and one of the greatest in the world (1,257,000 square miles); draining the entire western slope of the Alleghany-Appalachian range, and all the eastern slope of the United States Rockies save a small southern portion, with all between—19 States and two Territories in all, from New York to Montana, but narrowing considerably in the lower basin. The Missisipi extends nearly the entire length of the United States, from within 100 miles of Canada to the Gulf of Mexico, in a watercourse of about 2,550 miles, varied slightly by the lower river bends and cut-offs; and forms the boundary, total or partial, of 10 States — Minnesota, Iowa, Missouri, Arkansas and Louisiana, on the west, and Wisconsin, Illinois, Kentucky, Tennessee and Mississippi, on the east. On its banks are four cities with populations exceeding 230,000 (Saint Louis, New Orleans, Saint Paul and Minneapolis), and 17 others of over 10,000 — Winona, Minn.; La Crosse, Wis.; Dubuque, Clinton, Davenport, Muscatine, Burlington and Keokuk, Iowa; Rock Island, Quincy, Alton and Cairo, Ill.; Hannibal, Mo.; Memphis, Tenn.; Vicksburg and Natchez, Miss.; and Baton Rouge, La. It is navigable over 2,000 miles from its mouth to Minneapolis (Falls of Saint Anthony), though the end of regular navigation is Saint Paul, 13 miles below; and is brokenly navigated by smaller steamers to Leech River, 415 miles farther on, along different reaches. It has about 100,000 tributaries, 240 large enough to figure on small-sized statistical charts, 45 of them navigable for distances varying from 2,300 to 50 miles, and aggregating some 15,700 miles of inland navigation; steamers can go upon it and its tributaries some 4,000 miles east and west without breaking bulk — from Great Falls, Mont., on the Missouri, to Olean, N. Y., on the Allegheny. The greatest of the affluents, the Missouri, is usually considered the main stream, being about 1,600 miles longer than the upper Mississippi above the mouth (4,200 miles from the Gulf, the longest river course on the globe), having a basin more than three times as great, and discharging a considerably larger volume of water annually; nevertheless the upper Mississippi has so much steadier a flow — the Missouri shrinking at low water to 1-48 the volume in flood, and practically unnavigable then — that the former as between the two maintains the permanent navigability of the joint stream, and is justly enough held the main body in popular estimation; besides that the axial valley is continuous. Moreover, the Ohio with its great rainfall (41.5 inches, against 35.2 for the upper Mississippi and 20.9 for the Missouri) discharges far more than either, and if that were valid ground, should itself be held the main stream.

The chief tributaries of the lower Mississippi are as follows, in order of contribution to the volume of water in the lower river: Ohio, 1,300 miles long (to source of Allegheny); width 1,200 feet at Pittsburgh, 3,000 at mouth; basin, 207,111 square miles; annual discharge, about 5,000,000,000,000 cubic feet; per second, 158,000. Missouri, 2,908 miles long; width, 1,500 feet at Fort Benton (head of large-steamer navigation), 3,000 at mouth; basin, 527,690 square miles; annual discharge, 3,780,000,000,000 cubic feet; per second, 120,000. Upper Mississippi, 1,330 miles long; width, 1,200 feet at Saint Paul (head of large navigation), 5,000 at junction with the Missouri, basin 179,635 square miles; annual discharge, 3,300,000,000,000 cubic feet; per second, 105,000. Arkansas, 1,514 miles long; width, 1,500 feet at Fort Smith (head of large navigation), and about the same to its mouth; basin, 184,742 square miles; annual discharge, 2,000,000,000,000 cubic feet; per second, 63,000. Red, 1,200 miles long; width, widely varying from log dams, etc.; annual discharge, 1,800,000,000,000 cubic feet; per second, 57,000. The three next greatest basins are the White, Yazoo and Saint Francis. The total annual discharge, including three outlet bayous, is 21,300,000,000,000 cubic feet, or 675,000 per second.

The following are the distances from the farthest sources on the main stem to the chief landmarks on its course, and the mean-water elevations above sea-level at the end of the reaches:

	Dist., Miles	Elev., Feet
Mississippi Springs, above Itasca, and 6¼ miles from outlet	.....	1535
Outlet at Itasca to outlet at Winnibigoshish Lake	114	1292.8
To Falls of Saint Anthony (Minneapolis)	546	782
To Saint Paul, Minn	559	680.5
To La Crosse, Wis	715	621.2
To Prairie du Chien, Wis	787	597.5
To Dubuque, Iowa	849	578.2
To Rock Island, Ill	957	533.7
To Burlington, Iowa	1,039	505.1
To Keokuk, Iowa	1,086	472.3
To Quincy Bridge, Ill	1,127	453.8
To Hannibal, Mo	1,147	444.9
To mouth of Illinois River	1,249	399.4
To Saint Louis, Mo	1,288	384.8
To mouth of Ohio River (Cairo, Ill)	1,470	275
To Memphis, Tenn	1,695	201
To Natchez, Miss	2,177	40.5
To Baton Rouge, La	2,310	18.5
To New Orleans, La	2,435	8
To Fort Saint Philip, La	2,509	3
To head of Passes	2,529	1.8
To Gulf	2,546	.....
(Or 2,553 miles from ultimate sources).		

The «source» of a great river is often a term of little import, as its waters may gather from the drainage of a large district; but taking it in its current sense, of the ultimate reservoir of its farthest extension, the Mississippi rises in the basin draining into Itasca Lake (q.v.) in northern Minnesota. Into the west arm flows from the heights, through a couple of small ponds, a stream of considerable power and fullness, called by its discoverer Nicollet the «Infant Mississippi,» and now confirmed as such so far as there is one ultimate stream; and out of it, from the north arm, flows the Mississippi. Nicolett in 1836 found it 16 feet wide and 14 inches deep at the outlet. Government Commissioner J. V. Brower in 1893 found it 50 feet wide and three or four feet deep in mid-channel, with a muddy bottom and a current of about two miles an hour. As the current increases it narrows to some 30 feet; is filled with débris, shoals and boulders; and for some distance down the stream free passage with canoes is impeded by reeds, flag and water grass. It continues northward with slight falls and rapids to Lac Travers or Bemidji, about 10 miles long by 4 feet wide, set in a basin surrounded by forested hills and with a beach of perfectly white sand. Thence it issues on the east, and for 25 miles southeastwardly brawls over a series of rapids, from whose foot it flows in a clear even stream 120 feet wide and four or five deep to Cass Lake, twice as large as Bemidji; thence on the east six miles to Winnibigoshish, still larger, whence it issues again on the east 172 feet wide, and as before grows narrower, deeper and of swifter current as it drains the marshes and meadows below. Just above the junction with Leech River, the outlet of the noble Leech Lake, the largest in this region — 25 by 15 miles — it strikes a bed of sandstone with a fall of 20 feet in one-sixth of a mile, and is ruffled into rapids called the Falls of Pokegama, in a channel 80 feet wide. This is about 130 miles from the source; small steamers run to the foot of the rapids. Thence it runs crookedly with a general south trend, about 120 feet wide, through hardwood forests, swamps and sandhills, covered with glacial gravel and boulder drift. From the entrance of Swan River to that of the outlet of Sandy Lake there are six rapids; the latter lake has a small stream running from a small pond to the eastward, not far from Saint Louis River, emptying into Lake Superior at Duluth, and forms the old canoe route from Minnesota to the Great Lakes. Thence to the entrance of Pine River, about 150 miles from the Pokegama Falls, it has numerous rapids and is broad enough to enclose several islands; it receives several smaller tributaries; and the powerful Crow Wing River, 47 miles below Pine River, also fed from a district of lakes, contributes almost as much volume to the joint stream as the Mississippi itself. At the Sauk Rapids, a mile long, 133 miles below the Crow Wing and at the entrance of Sauk River, begin the first rocky banks of Potsdam sandstone, extending down to Rock Island.

At the Falls of Saint Anthony, 80 miles below, the river descends about 65 feet in three-fourths of a mile, forming rapids interrupted in the middle by a precipice 18 feet high, over which the river, now 1,200 feet wide, formerly plunged in a cataract of great beauty and fame. An island divided it into two channels, the western being the larger. Here the water power has been used to build up the immense manufacturing interests of Minneapolis. Thirteen miles below a convenient landing has established Saint Paul as the head of continuous navigation for large steamers and made it the great wholesale distributing point for the Northwest, and onward the valley is richly fertile, very beautiful and often of much grandeur. Below Saint Paul the river widens into the island-studded «Lake» Pepin. From Davenport, Iowa, 943 miles from the source, to Rock Island, 14 miles below, there are rapids of 22 feet fall, formerly obstructing the navigation; the government has now cut a channel in the solid rock. The formation of the bed is peculiar; it consists of stratified limestone, crushed into folds which form a series of six or seven parallel bars across the channel, one to three miles apart. From this point onward the formation is carboniferous and the banks rise into picturesque rocky bluffs sometimes 300 feet high, as far down as nearly to the beginning of the alluvial region, 140 miles below Saint Louis. At the mouth of the Des Moines River, 130 miles below Rock Island, is another rapid of 24 feet fall, now avoided by a ship canal; and between Muscatine and Keokuk is one 12 miles long, with 23 feet descent. Nearly 200 miles below Keokuk the first great change comes to the river. Into this clear placid stream is poured a swift, muddy, red torrent, at high water of far greater volume than its own, that of the enormous Missouri, creating turbulent eddies, and for many miles flowing side by side with the white northern stream without mixing of waters. The bends and winds of the river, making the current cross from side to side, finally mingling them within 100 or 150 miles. Not quite 200 miles farther on comes in the mighty Ohio, with a volume over two-thirds as great as that of the other two united.

But 30 miles above here and three miles above the great geological landmark of Cape Girardeau, Mo., begins a still greater change: the vast northern upland, mainly elevated rock with a moderate soil covering it, which has been drained by the river, ceases. The remaining 1,100 miles of its valley is the creation of its own silt, through which it meanders in deep curves and loops and narrow horseshoes, shifting its channel capriciously, continually building up one side and cutting away the other, but rarely twice the same side. Cape Girardeau is an ancient headland of an ancient ocean, into which the silt-laden river poured its deposits as the present river does into the Gulf, and which has receded, leaving more than 1,000 miles of the garden of the world. And the relation of the river to its bottoms is reversed also. From the Falls of Saint Anthony to the end of the uplands are deep strips of bottom land overflowed at high water; but except at such periods they are above the river. But in the lower bottoms made by the river itself, the surface of the latter is normally *above* that of the bordering lands. The friction of the current on the sides and bottom causes the water held back to keep depositing fresh layers of the heavier sediment on the edges and in the channel; so that as the depth of water remains the same and the channel continually shallows, the surface of the water must rise and would at last empty itself did not the same process elevate its retaining walls. The river therefore runs in a groove, cut into a ridge considerably above the surrounding country, its surface much higher and its bed much lower than the region for many miles back; it slopes away with a gradient at first of about seven feet to the mile, decreasing regularly to the outer edges of the flood plain — which at the Ohio is about 10 miles wide and 50 to 70 in lower Louisiana, widening to 150 at the Delta — and ending at about six inches per mile in the swamps and bayous at the outer edge. The natural method of discharging the waters at flood seasons is to overflow the banks and flood the adjacent country, part of the waters flowing off through semi-river channels (bayous) in the soft earth, the rest remaining in pools and swamps and gradually evaporating; and the attempt to keep it in the same channel which suffices for low water, to comport with the needs of civilized occupancy, has produced an excessively costly battle with nature, of which the success is by no means yet assured or assurable.

The junction of the Red introduces us to still another phenomenon. That great river formerly discharged its main waters to the Gulf through the Atchafalaya «Bayou,» roughly parallel with the Mississippi; but that and the Mississippi both sent their surplus waters through an amazing network of lesser bayous, which still penetrate southern Louisiana with thousands of miles of navigable channels. The head of the Atchafalaya silted up and became choked with logs and rubbish, and the Red opened a channel into the Mississippi; later in the 19th century the government dredged out the head of the bayou to make a navigable channel; it rapidly widened to a great river, became again the main channel of the Red and threatened to ruin a great district of fertile plantations, so that works had to be undertaken to prevent its enlargement. As we approach the place where the Mississippi plain merges in the great coastal plain of the Atlantic, the surface grows lower and the soil spongier; and the river (which above the Mississippi is about a mile wide, thence to the Red half a mile to a mile, with occasional reaches of a mile and a half, and below the Red narrows to a width of about 3,000 feet, which it retains with curious persistence) widens to about a mile and a half and enters the Gulf — through the Delta, a quaking, impassable, finally half liquid salt marsh land in process of making — by three great arms or «passes,» of which two ramify still further. These are known as the Southwest Pass, the South Pass (with two arms near the Gulf) and an eastern arm soon dividing into North Pass and Pass à l'Outre.

It should be said, however, that these alluvial bottoms do not quite monopolize the space from the Ohio to the Gulf. Here and there on the east bank there are spots where high solid ground, old capes and peninsulas of the antique ocean, come down to the river side; as at Columbus, Ky., Randolph and Memphis, Tenn., Vicksburg, Grand Gulf and Natchez, Miss., and Baton Rouge, La. With one exception, each of these spots has been utilized as a considerable road for the commerce of the interior to the great waterway.

Improvements of the River.— These are broadly divisible into two classes: those designed to improve navigation and those designed to prevent overflows. From 4 March 1789 to 30 June 1886, a period of 97 years, in the improvement of the Mississippi and its 44 navigable tributaries, the Federal government expended a total sum in round numbers of about $57,000,000. The control of the waters of the Mississippi so as to make the navigation of the river safe and so as to make the immediately surrounding country fit for agriculture has been an economic problem of more than merely local interest. The problem is national historically, for to the control of the Mississippi as much as to any other one thing the historical growth of the country is due. It is even more strikingly true that the problem is of national significance from the commercial point of view, simply because this vast river drains the richest territory in the world, 70 per cent of the area of the United States. Among the older methods of control was that of narrowing the channel to deepen the available water. This operation involved closing off side channels around islands, etc.— stopping up the heads, diking off small bays and inlets, strengthening caving banks and obstructing the side current by solid spur dikes, set obliquely out into the stream nearly to the channel line. After the entrance of the Missouri, the mass of sediment furnishes a new and effective weapon. Between here and Cairo hurdles of piles and brush are laid along the banks, jetty fashion; the sediment packs into the brush and speedily becomes solid, and the results in creating new banks to narrow the channel have been most gratifying, besides reclaiming large tracts of overflowed bottom lands. Caving banks are protected by mattresses; the depth of water being slight, they are made lighter than in the lower river. Below Cairo the work is of the same nature, but more difficult from the volume of water and the alluvial lands easily crumbling. Here the channel is narrowed, where it exceeds about 3,500 feet, by mattresses from 800 to 2,000 feet long and 200 to 300 feet wide, weighted down with rubble stone. But the immense weight of water, which may be from 60 to 100 feet deep at flood, has forced their continual increase in weight and strength of construction. The brush and small saplings have been replaced by fascines (solid rods tightly withed together), the binding poles by strong wire; the cost per foot of bank protection trebling in 25 years, from about $10 to $30. For closing off side channels and watercourses, rows of piles are driven in, 8 or 10 feet apart and the rows 20, and the upper row interwoven with brush. Caving banks are graded down to a slope and faced with mattresses; of late, however, rubble stone has been used with better success. On the lower river, where stone has to be brought from long distances, concrete has been experimented with.

Another system is that of levees. Formerly, under the slave system, each planter along the rivers liable to overflow had rude dikes erected for himself; the importance of the work to neighborhoods led to common town action, then to county and State action. These levee systems, of course, were broken through in floods, but the water rose only to its natural height in the channel and soon subsided; and to furnish absolute security against overflow would cost not only an enormous sum but would exceed a hundredfold the capital value of the districts imperiled. When in 1879 Congress appointed the Mississippi River Commission, it forbade them to consider the protection of lands from overflow as part of their work. Nevertheless a majority of the commission believed that the levee system could be used efficiently to improve navigation, and estimated that $11,443,000 below Cairo would furnish a complete protection for the banks and double the depth of permanent river channel, by the natural scour of the water as with jetties. The level of the river has risen with the levees over six feet and is estimated to ultimately reach 11 when the levee system has made a smooth solid bank all the way, with no place for overspill. These levees are from 8 to 14 feet high, with a width on top of eight feet and a side slope of one-third; they project three feet above high water, but need to be raised every few years as the river rises. They have to be placed near the banks to protect riverside plantations and avoid the slope away from the river; and very large amounts of them have to be replaced yearly from cave-ins.

The Act of 28 June 1879, by which the commission was created, defines its duty in part as follows:

> To direct and complete such surveys of said river, between the Head of the Passes near its mouth to its headwaters as may now be in progress, and to make such additional surveys, examinations, and investigations, topographical, hydrographical, and hydrometrical, of said river and its tributaries as may be deemed necessary by said commission to carry out the objects of this act. . . . To take into consideration and mature such plan or plans and estimates as will correct, permanently locate, and deepen the channel and protect the banks of the Mississippi River; improve and give safety and ease to the navigation thereof; prevent destructive floods; promote and facilitate commerce, trade, and the postal service; . . .

Under the authority of this and subsequent acts making appropriations and relating to the subject, surveys and observations have been carried on and works of improvement under the authority and direction of laws making appropriation for that purpose have been undertaken and executed. The original project contained in the report of the Mississippi River Commission dated 17 Feb. 1880 contemplated the permanent fixing and improvement of the channel to a depth of at least 10 feet at extreme low water by the construction of the low-water width to about 3,000 feet, the protection of the banks against caving and the control of the flood water by means of levees. This report was the one upon which Congress made its first appropriation for the improvement of the Mississippi River under commission plans, thereby officially adopting such plans for the inauguration of this work.

When the Mississippi River Commission began the work of improvement there were few, if any, precedents of practical value to serve as guides in a project of such magnitude. But very meagre data as to the regimen of the river were available, and a thorough knowledge of its many varying phases was essential before satisfactory comprehensive plans of improvement could be developed. Exhaustive surveys and observations of the physics of the river from the headwaters to the mouth were therefore inaugurated and carried on until the data needed were secured and experiments with various kinds of plant and material were also made in order to develop the equipment and type of construction needed for efficient work. This work occupied several years. During these years the appropriations were comparatively small, and sometimes failed altogether, with disastrous results to the channel works, so progress was necessarily slow. As a result of the knowledge of the regimen of the river acquired and the lesson taught by the experimental work, definite projects are now entered upon with confidence of success, but efforts looking to improved methods to secure greater efficiency and economy will be continued.

The earlier works were designed primarily for the rectification and improvement of the channel, and were confined to the Plum Point Reach, 147 to 186 miles, and Lake Providence Reach, 517 to 552 miles below Cairo. These reaches were selected because here the shifting sand bars and deficient depths were most pronounced and the low-water navigation most difficult. Highly beneficial results were obtained in the improvement of the channel depths in those reaches, and the work done in them confirmed the soundness of the theory upon which it was based, but also demonstrated that more substantial types of construction were needed and that the permanent improvement of the channel by contraction and revetment works would consume a long period of time, while the pressing needs of commerce called for immediate relief. The development in hydraulic dredging machinery had reached such a stage at this time as to hold out the hope that an immediate and economical solution of the problem of temporarily deepening the channel for navigation purposes might be found in the opening and maintenance of channels across the obstructing bars at each low-water season by means of dredging. After extended studies and experiments, hydraulic dredges of large capacity adapted to the peculiar service required were developed by the commission and this method of temporary improvement of the low-water channel was adopted with a view of maintaining a navigable channel not less than 250 feet in width and 9 feet in depth, and has been applied with success.

Since the adoption of dredging, the permanent work of channel improvement has been confined to the revetment of banks, and a type of revetment has been developed which successfully withstands the scouring action of the river. Concrete has been largely substituted for the upper bank revetment, and its use for sinking the present type of willow mat, as well as a possible substitute for the mat itself, is being tried out with a view to further economy and increased efficiency.

The extent of bank revetment is, however, relatively so great when compared to the funds available for its construction that it has been necessary to confine the work to cases of urgent necessity, such as caving banks which threaten cut-offs or the safety of large levees which could only be replaced at excessive cost, and the harbor fronts of cities. Substantial revetment for the purpose of fixing the banks of the river is essential to any successful scheme of improvement, and as the project adopted by

Congress requires that the commission shall «correct, permanently locate and deepen the channel and protect the banks of the Mississippi River,» large increase in expenditures for revetment construction are urgently needed.

An important item in the operation of the commission is the construction and general repair of levees, which was first authorized without qualifying restrictions by the Act of 19 Sept. 1890; and since that date about one-half of the appropriations made by Congress have been devoted to that purpose.

Briefly stated in general terms and quoting in part the several acts of Congress under which the project is being carried out, the work now in progress covers the Mississippi River from Rock Island, Ill., to the Head of the Passes, 1,568 miles, «the Ohio River from its mouth to the mouth of the Cache River,» and «the Arkansas River between its mouth and the intersection thereof with the division line between Lincoln and Jefferson counties,» and it includes:

1. Flood protection by construction, extension, and repair of levees from Rock Island, Ill., to Head of the Passes, 1,568 miles; along the Ohio River below the mouth of the Cache River and the Arkansas River up to the Lincoln-Jefferson County line, in co-operation with the several States and levee boards, to "prevent destructive floods."

2. Continuation of improvement below the mouth of the Ohio River so as to "give safety and ease to navigation" of the Mississippi River at flood states by facilitating the interchange of traffic, "commerce, trade, and the Postal Service with a view to securing a permanent channel depth of 9 feet" by means of:

(a) Revetment of caving banks to "correct, permanently locate, and deepen the channel, and protect the banks of the Mississippi River;" and for the preservation of harbors and the security of levees.

(b) Dredging for the purpose of maintaining at all stages a "navigable channel 250 feet in width and 9 feet in depth," including construction, operation and maintenance of suitable dredge boats and auxiliary devices and appliances therefor.

3. The maintenance of a navigable channel between the waters of the Mississippi, Red and Atchafalaya rivers.

4. Physical investigations, maintenance of gauges and discharge measurements of the Mississippi River and its tributaries; preparation and publication of maps and physical data; surveys and investigations covering all phases of river regimen governing the work of channel improvement and flood control "from the headwaters of the Mississippi River to the Head of the Passes."

5. Other miscellaneous details incident to the execution of the general project.

Since the creation of the Mississippi River Commission in 1879 there has been appropriated and allotted for expenditure under it on the Mississippi River and its tributaries to 1917, $96,375,610.68.

Consult Anderson, A. D., ‹The Mississippi and its Forty-four Navigable Tributaries› (Washington 1890); Chambers, J., ‹The Mississippi River and its Wonderful Valley; Twenty-seven Hundred and Seventy-five Miles from Source to Sea› (New York 1910); Ocken, ‹The Mississippi: Some of its Physical Characteristics› (1900); Clemens, ‹Life on the Mississippi› (1883); ‹Mississippi River Commission› in *Annual Report,* Chief of Engineers, United States Army, War Department (Washington, D. C., 1879–1918).

FORREST MORGAN.

MISSISSIPPI SCHEME. See MISSISSIPPI BUBBLE.

MISSISSIPPI SOUND, an arm of the Gulf of Mexico, extending along the coasts of Mississippi and Alabama from Bay Saint Louis on the east to Mobile Bay on the west and connecting with the latter by Grant's Pass. It is about 100 miles long, from 7 to 15 miles wide, from 6 to 10 feet deep and is formed by a chain of low, narrow, sandy islands, chief of which are Daphine, Petit Bois, Horn, Ship and Cat. It is traversed by steamers and coasting vessels trading between New Orleans and Mobile.

MISSISSIPPIAN. See CARBONIFEROUS.

MISSOLONGHI, mĭs-sō-lŏng'gē, or **MESOLONGI,** mā-sō-lŏng'gē, Greece, a northwestern town, capital of the nomarchy of Acarnania and Ætolia, on the marshy site on the north side of the Gulf of Patras, 24 miles west of Lepanto and the seat of an archbishop. Missolonghi is the most important strategical point of western Greece and is famous for the sieges it has undergone. In 1804 it came under the rule of Ali Pasha. In the Greek revolt against the Turkish conquerors in 1821 it was brilliantly defended by 400 men against a Turkish army of 14,000 for two months; when reinforced, they again for over a year resisted the Turks, who raised the siege 6 Jan. 1823. The town was hastily fortified, and from September to December 1823 was again besieged by the Turks, who were defeated by a small Greek force under Marcos Bozzaris (q.v.), but with the loss of their patriotic general. In 1825–26 it stood a long siege by the Turks. A body of its defenders cut their way through the Turkish force and escaped; the remainder determined to sell their lives as dearly as possible, and when the Turks forced their way in, the powder magazine was exploded, thus overwhelming besiegers and besieged in one common catastrophe. Lord Byron, who went to Missolonghi 5 Jan. 1824 to aid the Greeks, died there 19 April 1824; his heart was interred in the church of Saint Spyridion, and a monument was erected by the Greeks in his honor. Here also is the tomb of Bozzaris. Pop. about 10,702.

MISSON, Francis Maximilian, French traveler and author: b. Lyon, about 1650; d. London, England, 12 Jan. 1722. He was a Councillor in the Parliament of Paris, but at the revocation of the Edict of Nantes, as a Protestant, fled to England. There, in 1685, he became tutor to Charles Butler, afterward Earl of Arran, whom he accompanied on his travels. In 1691 he published ‹Voyage d'Italie,› in which his comments on the customs of the Roman Catholic Church led to a celebrated controversy with Father Freschot. In 1698 he published a volume of ‹Mémoires et observations,› which constitutes a humorous descriptive dictionary of London life in Queen Anne's reign. His other chief work is ‹Théatre sacré des Cévennes› (1707).

MISSOULA, mĭ-zoo-la, Mont., city, county-seat of Missoula County, situated on both sides of the Missoula River, a tributary of the Columbia River, in a beautiful and fertile valley, called by the early settlers Hell Gate Ronde, on the main line of the Northern Pacific and the Chicago, Milwaukee and Saint Paul railroads. The city has an elevation of 3,201 feet above sea-level and is situated in 46° 52′ N. lat., and 113° 50′ W. long., 120 miles by rail northwest of Helena. The city is noted for its mild and salubrious climate, the winters being mild and the summers and fall offering a really delightful climatic condition. The city has many attractions for summer tourists on account of the beauty of its environment and the fine outing advantages of the surrounding country. Hunting and fishing are exceptionally good in this vicinity. The first log cabin was built at Hell Gate, a short distance from Missoula, in 1864. Worden and Company were the pioneer merchants of this district. In 1865 they built a grist and saw mill and opened a general store. The city was at that time known as Missoula Mills. It was incorporated in 1883 and the name changed to Missoula. Radiating from this city are numerous valleys which have developed into wonderfully productive agricultural sections. Missoula is the natural distributing centre for this rich and growing territory. The chief resources of this district are diversified farming, lumbering, dairying, horticulture and mining. There has been much development in this district during the past few years. Five branch lines running out of Missoula increase the distributing possibilities of this section. This section contributed a large amount of the prize winning grain and apples at the Panama-Pacific Exposition and is noted for the quality and quantity of its products per acre. The city itself is modern in every respect. The streetcar system, sanitary and storm sewers, pavements, up-to-date lighting system and handsome public buildings make this one of the leading and most substantial cities of its size in the Northwest. From an educational standpoint it is exceptionally well equipped. Missoula is the seat of the University of Montana and in addition has one of the most efficient public school systems in the State. The county high school is in every way first class. There is also a Catholic academy and high school which ranks high among the accredited high schools of the State. Practically every religious denomination of consequence is represented in the city and the majority own handsome church buildings. The Missoula Business and Normal College gives an opportunity for business training and has a high standard. Among Missoula's public buildings are the Federal building, Land Office and Federal court, courthouse, Elk's temple, Masonic temple, Knights of Pythias, Montana block, opera house, library, Chamber of Commerce building and many other structures creditable to a city of much larger size. Fort Missoula is located four miles to the south of the city and Bonner — noted for its large lumber mills — six miles to the east.

From the standpoint of the historian Missoula is of exceptional interest. The city is located in a district noted for its intimate connection with the important facts in the early history of the State. The first gold in Montana was discovered within a few miles of this city and there is considerable mining activity throughout this district. The Flathead Indian Reservation, about 15 miles north of the city, contains approximately 1,750,000 acres of fine agricultural, grazing and timber lands. This body of land has been surveyed by the United States government, and thrown open to settlement. Practically all of the available land has been taken up. Over 2,000,000 bushels of grain were raised there last year. Missoula is situated in the heart of the country formerly occupied by the Flathead tribe of Indians which was ceded to the United States by a treaty made in 1855, known as the Stevens Treaty. Missoula is a Flathead Indian name or word, meaning or signifying «At the stream or water of surprise or ambush.» In the olden days prior to the advent of white men amongst the Indians of this section, the Blackfeet, who were very numerous, and occupied the country on the waters of the upper Missouri, and the Flatheads, who occupied the country in the vicinity of Missoula, were hereditary enemies and engaged in a continuous warfare one against the other. The place where the city of Missoula is now located, being at the western foot of the mountains, and near the mouth of a long and deep cañon, with a beautiful stream of water near by, was a favorite camping place for the Flatheads with their lodges and families. The Blackfeet, having a knowledge of this fact, would often take advantage of it, and when on the warpath would secrete themselves in the willows and rocks, and from this ambush attack their unsuspecting enemies, hence the name, «at the stream or water of surprise or ambush.» Missoula is known throughout the State as the «Garden City,» because of its magnificent gardens and the abundance of flowers grown here. The city is supplied with an abundance of electricity generated at its power plant on the Big Blackfoot River and transmitted by cable a distance of seven miles. Among its industrial establishments are a beet-sugar factory, creamery, flour mill, sash and door factory, potato-chip works, vinegar and cider factories, brick and tile plants, bookbinderies and a lithographing establishment. It also has an abundance of water of the best quality, supplied by a water company from a never-failing stream coming direct from the snow-clad mountains to the northeast of the city. Pop. (1920) 12,668.

D. D. Richards,
Secretary Missoula Chamber of Commerce.

MISSOURI, mĭ-zoo'rĭ, State of the North American Union, geographically the central commonwealth of continental United States. Sometimes called a Southern State and again a Western State, it is neither southern nor western, in history, population nor location. Though it extends farther south than Virginia, it extends farther north than Kansas. It is practically well-nigh equally divided between the two great parties. Its negro population is small, only 5 per cent of the total. Though an original slave State, Missouri abolished slavery by its own act. It may be properly classed not as northern or southern, eastern or western, but as a central State. The State is bounded on the north by Iowa, on the south by Arkansas, on the east by Illinois, Kentucky and Tennessee and on the west by Nebraska, Kansas and Oklahoma. Its capital is Jefferson City. In area it is 69,415 square miles (693 of water). It is larger than any State east of or bordering on the Mississippi except Minnesota. The census of 1910 gives the population of the State as 3,293,335. By 1920 it had increased to 3,404,055.

Physiography.— Missouri has three distinct physiographic regions: the Upland Plain of the northern and western part of the State, the Ozark Plateau of the southern half of the State and the lowland area in the southeastern corner of the State. The upland area and the Ozark regions are separated from Saint Louis to Boonville by the Missouri River. At Boonville the line turns to the southwest and passes out of the State to the north of Joplin. There is a well-marked escarpment between the Ozark Plateau and the southeast lowlands. The lowlands have an altitude of little more than 300 feet above sea-level. The upland area is marked by broad rolling hills and wide valleys. Much good farming land is in this region. The Ozark region of the southern part of the State is distinctly different in its topography from the upland region of northern Missouri, though at their junction they grade into each other. The Ozark region has a mature topography, nearly every bit of the region being in a slope. The crests of the ridges are very narrow and only the largest streams have developed river flats to any extent. The ridges have about the same altitude. The region is densely forested.

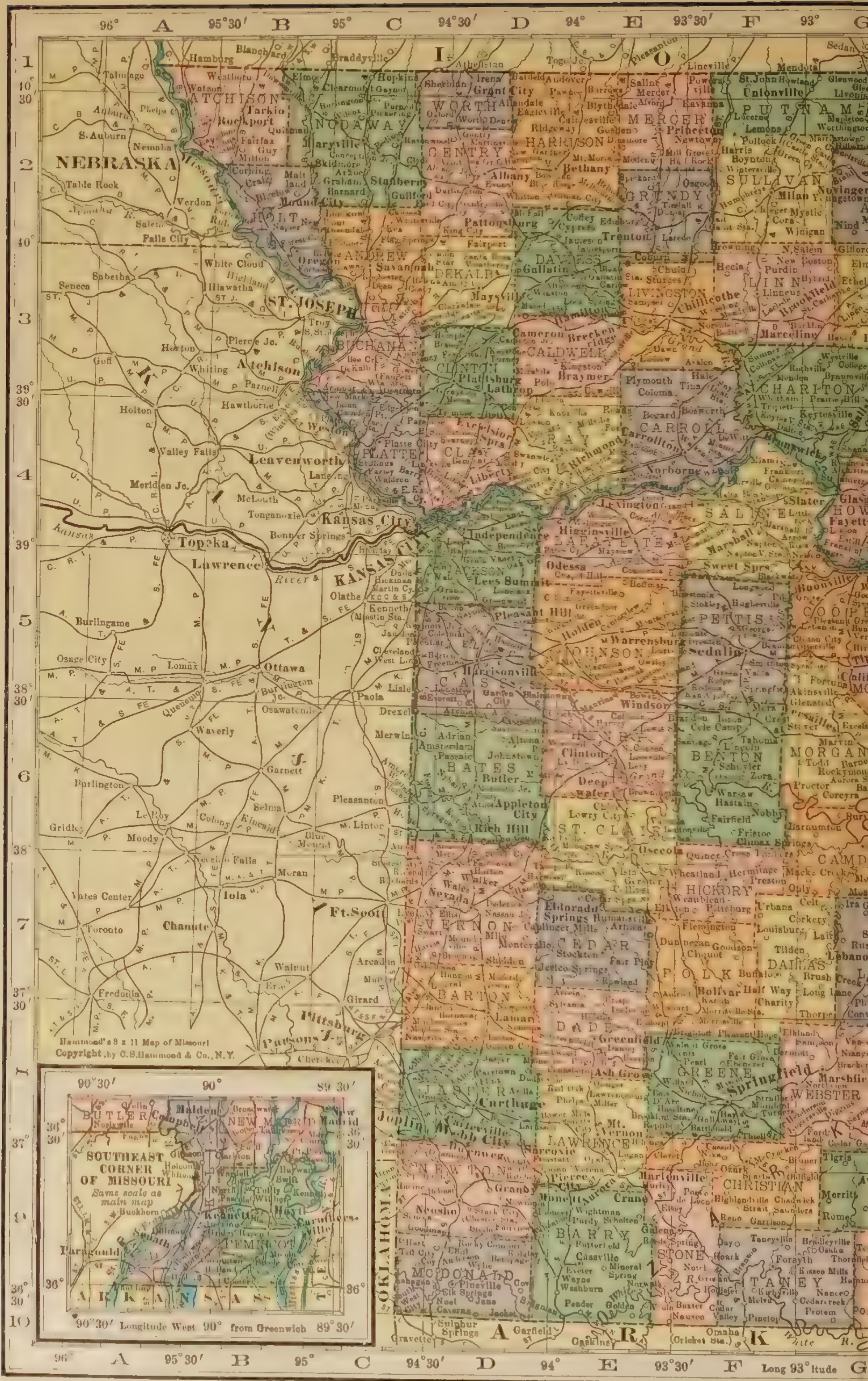
River Systems.—Missouri has possibly more miles of navigable rivers than any State in the Union. Along the eastern shore of the State flows the Mississippi, which affords transportation 10 months of the year. The Missouri River forms the northern half of the western border, and turning east cuts the State into halves and unites with the Mississippi at a point 12 miles north of Saint Louis. From the Ozarks flow the Osage, the Gasconade, the White and other smaller streams north and east into the Missouri. The Meramac flows through a hilly, wooded country northeast and empties into the Mississippi near Saint Louis. North of the Missouri are smaller tributaries, principal among which are the Grand, the Chariton and the Platte rivers. All small rivers in the northern half of the State east of Macon flow into the Mississippi. The largest of these is the Salt River.

Climate.— Missouri is in the central portion of the United States far from either ocean and unprotected by mountain ranges. The climate is, therefore, one of extremes both in warm and cold weather, moisture and drought. The highest range of mountains in the State, the Ozarks, is not sufficiently lofty to affect the climate of the State at large and influences the climates of the neighboring counties only to a slight degree. The mean summer temperature, as shown by the observation of the United States Weather Bureau, for the portion of the State north of the Missouri River for a period of 27 years is 74° and for the southern portion 78.5°. The maximum temperature, however, is often more than 100°. The winter temperature during this period averaged 33.9° for the State, varying from 28.5° in the northern half to 39.5° in the southern half. The winter climate is variable. Often the temperature falls below zero. During other winters the temperature scarcely reaches zero. In the winter months of 1915 a temperature of 30° and slightly more below zero was registered in several sections of the northern half of the State. The Mississippi River is frequently frozen over at Saint Louis and other river points. Ice gorges form about the piers of the bridges, blocking all river traffic. In some winters the Missouri River is frozen over during the entire season. The Mississippi often remains open until the middle of the month of February and at other times closes early in December. The mean annual temperature of the State varies from 53° to 57°. In spite of abundant rains the climate is, generally speaking, a dry one. The evaporation is so rapid that the atmosphere is seldom overloaded with moisture. A clear sky, a fertile, productive soil and fair weather are among the chief natural advantages of the State. Thunderstorms are of frequent occurrence, especially in the month of June.

Farming and Stock Raising.— The staple products of Missouri are wheat, oats, Indian corn and rye, but in the southern portions of the State cotton, hemp and flax are raised to some extent. Thirty bushels of wheat to the acre is an average yield but is often far exceeded. The flour from Missouri wheat is in great demand in foreign as well as home markets, and is regarded as of a high quality. All kinds of grass which favor stock raising grow luxuriantly, such as blue grass, timothy, red top and red and white clover. The raising of pork is a large industry, due to the cheapness of feed. All kinds of fruits are successfully cultivated, not only the more hardy fruits, such as the apple, pear, plum and cherry, but those which require a softer climate, such as apricots and many varieties of grapes. Apples and peaches grow well in all parts of the State. In the southern portion of the State, particularly in the southwest, are grown many varieties of grapes. In the southern counties of Missouri sheep raising has been carried on at a profit, the mild climate, the quality of grass and the abundance of good water being especially favorable here to this particular branch of stock raising. There are in Missouri 24,832,966 acres of improved land. The land surface of the State is approximately 43,985,280 acres. Much of the unimproved land is in forests. The value of farms, including land and improvements, not buildings, as estimated by the Census Bureau is $3,591,068,085; the value of the buildings, $468,774,429; of the implements and machinery, $138,261,340, and of livestock, $389,839,045. There are on farms throughout the State 870,000 horses, 373,000 mules, 777,000 milch cows, 1,890,000 other cattle, 1,105,000 sheep and 4,306,000 swine. Missouri ranks high among the corn-producing States of the Union. No State in the Union raises as many mules. The chief crops, with their acreage, yield and value for the year 1922 were: corn 6,150,000 acres 175,275,000 bushels, $119,187,000; spring wheat, 5,000 acres, 68,000 bushels, $71,000; winter wheat, 3,100,000 acres, 38,750,000 bushels, $40,688,000; barley, 5,000 acres, 115,000 bushels, $83,000; clover seed, 21,000 acres, 36,000 bushels, $324,000; oats, 1,117,000 acres, 17,872,000 bushels, $7,864,000; buckwheat, 1,000 acres, 13,000 bushels, $16,000; rye, 28,000 acres, 336,000 bushels, $312,000; broom corn, 3,000 acres, 800 tons, $180,000; tame hay, 3,520,000 acres, 3,872,000 tons, $44,528,000; sorghum sirup, 24,000 acres, 1,920,000 gallons, $1,632,000; potatoes, 90,000 acres, 5,400,000 bushels, $4,968,000; sweet potatoes, 14,000 acres, 1,300,000 bushels, $1,396,000; cotton, 198,000 acres, 149,000 bales, $16,018,000; tobacco, 5,000 acres, 4,500,000 pounds, $1,305,000; grain sorghums, 15,000 acres, 300,000 bushels, $225,000; apples, 9,400,000 bushels, peaches, 2,300,000 bushels, and pears, 450,000 bushels. The annual butter output is estimated at $12,000,000. The State is well adapted to the dairy industry. Strawberries are grown to the amount of about 15,000,000 quarts annually. Poultry raising is an important industry. The annual production of eggs is estimated at 100,000,000 dozens.

MISSOURI

Adrian, (D6)	955
Advance, (N8)	551
Affton, (M5)	650
Agency, (C3)	403
Alba, (D8)	470
Albany, (D2)	2,016
Aldrich, (E7)	261
Alexandria, (J2)	650
Allendale, (D2)	153
Allenton, (L5)	250
Allenville, (N8)	270
Alma, (E4)	369
Altamont, (D3)	349
Altenburg, (N7)	313
Alton, (K9)	484
Amazonia, (C3)	367
Amity, (D3)	174
Amoret, (C6)	390
Amsterdam, (C6)	188
Ancell, (N8)	198
Anderson, (D9)	918
Anglum, (M5)	300
Annapolis, (L8)	176
Anniston, (O9)	365
Appleton City, (D6)	1,262
Arcadia, (L7)	289
Archie, (D6)	250
Arcola, (E7)	300
Ardmore, (G3)	500
Argyle, (H6)	239
Armstrong, (G4)	616
Arrowrock, (F4)	286
Asbury, (C8)	226
Ashburn, (K3)	181
Ashgrove, (E8)	1,000
Ashland, (H5)	342
Ashley, (K4)	480
Ashton, (J2)	200
Atlanta, (H3)	536
Augusta, (L5)	308
Aurora, (E9)	3,575
Auxvasse, (J4)	484
Ava, (G9)	845
Avalon, (F3)	500
Avondale, (C4)	314
Bagnell, (G6)	200
Bakersfield, (H9)	270
Ballwin, (L5)	300
Baring, (H2)	248
Barnard, (C2)	345
Barnett, (G6)	221
Beaufort, (K6)	200
Bedford, (F3)	200
Belgrade, (L7)	250
Bell City, (N8)	316
Belle, (J6)	437
Bellflower, (K4)	297
Belmont, (O9)	250
Belton, (D5)	899
Benton, (O8)	312
Berger, (K5)	300
Bernie, (N9)	1,571
Bertrand, (O9)	355
Bethany, (E2)	2,080
Bethel, (J3)	254
Bevier, (G3)	1,868
Billings, (E8)	614
Birchtree, (J8)	452
Bismarck, (L7)	949
Blackburn, (F4)	333
Blackjack, (M5)	400
Blackwater, (G5)	478
Blairstown, (E5)	280
Bland, (J6)	470
Blodgett, (O8)	392
Bloomfield, (N9)	1,094
Bluesprings, (D4)	551
Blythedale, (E2)	294
Bogard, (E4)	381
Bois D'Arc, (F8)	200
Bolckow, (C2)	334
Bolivar, (F7)	1,980
Bonne Terre, (M6)	3,815
Bonnots Mill, (J5)	160
Boonville, (G5)	4,665
Bosworth, (F4)	672
Bourbon, (K6)	377
Bowen, (E5)	200
Bowling Green, (K4)	1,965
Bragg City, (B9)	402
Brandsville, (J9)	352
Branson, (F9)	598
Brashear, (H2)	339
Brasher, (C9)	170
Braymer, (E3)	1,018
Breckenridge, (E3)	860
Brewer, (N7)	200
Brimson, (E2)	171
Bronaugh, (D7)	285
Brookfield, (F3)	6,304
Brookline Station, (F8)	300
Browning, (F2)	694
Brownington, (E6)	333
Brownwood, (M8)	180
Brumley, (H6)	200
Brunswick, (F4)	1,411
Buckeye, (O9)	200
Bucklin, (G3)	863
Buckner, (D4)	439
Bucoda, (M9)	295
Buffalo, (F7)	915
Bunceton, (G5)	860
Bunker, (K8)	606
Burgess, (C7)	364
Burlington Jc. (C2)	970
Butler, (D6)	2,702
Cabool, (H8)	905
Cadet, (L7)	170
Cagle, (C8)	800
Cainesville, (E2)	1,051
Cairo, (H3)	221
Calhoun, (E6)	693
California, (G5)	2,218
Callao, (G3)	542
Camden, (D4)	534
Camden Point, (C4)	212
Cameron, (D3)	3,248
Campbell, (M10)	2,025
Canalou, (N9)	477
Canton, (J2)	1,949
Cape Girardeau, (O8)	10,252
Cardwell, (A9)	1,043
Carl Junction, (C8)	1,377
Carrollton, (E4)	3,218
Carterville, (D8)	2,434
Carthage, (D8)	10,068
Caruthersville, (C9)	4,750
Cassville, (E9)	1,002
Cedar City, (H5)	208
Cedar Valley, (F9)	300
Center, (K4)	575
Centertown, (H5)	243
Centerview, (E5)	268
Centerville, (L8)	500
Centralia, (H4)	2,071
Chaffee, (N8)	3,035
Chamois, (J5)	700
Charleston, (O9)	3,410
Chilhowee, (E5)	469
Chillicothe, (F3)	6,772
Chitwood, (C8)	1,600
Chula, (E3)	444
Clarence, (H3)	1,400
Clark, (H4)	315
Clarksburg, (G5)	441
Clarksdale, (C3)	375
Clarksville, (L4)	729
Clarkton, (B9)	689
Clayton, (M5)	3,028
Clearmont, (C1)	282
Clever, (F8)	347
Cliftonhill, (G4)	400
Climax Springs, (F6)	250
Clinton, (E6)	5,098
Clyde, (C2)	213
Coffey, (E2)	500
Cole Camp, (F6)	889
Collins, (E7)	265
Columbia, (H5)	10,392
Columbus, (E5)	190
Commerce, (O8)	593
Conception Junction, (C2)	518
Concordia, (E5)	962
Connelsville, (G2)	243
Conway, (G7)	394
Cooter, (B9)	540
Corder, (E4)	768
Corning, (B2)	255
Cosby, (C3)	163
Cottleville, (L5)	280
Cowgill, (E3)	381
Craig, (B2)	621
Crane, (E9)	1,151
Creighton, (D6)	335
Creve Coeur, (M5)	400
Crocker, (H7)	506
Cross Timbers, (F6)	500
Crystal City, (M6)	2,243
Cuba, (K6)	704
Curryville, (K4)	285
Dadeville, (E8)	333
Dalton, (F4)	398
Darlington, (D2)	311
Dawn, (E3)	400
Dearborn, (C3)	578
Deepwater, (E6)	1,391
Deerfield, (C7)	238
Dekalb, (C3)	401
Denver, (D2)	450
Desloge, (M7)	2,500
Desoto, (L6)	5,003
Desperes, (M5)	350
Dewitt, (F4)	360
Dexter, (N9)	2,635
Diamond, (D8)	500
Diehlstadt, (N9)	196
Dixon, (H6)	810
Doerun, (L7)	950
Doniphan, (L9)	1,248
Dover, (E4)	229
Downing, (H2)	566
Dresden, (F5)	180
Drexel, (C6)	543
Dudley, (M9)	257
Duenweg, (D8)	2,500
Duncan, (G8)	200
Dunnegan, (F7)	250
Durham, (J3)	200
Dykes, (H8)	240
Eagleville, (D2)	340
E. Atchison, (B4)	160
E. Bonneterre, (M7)	298
E. Lynne, (D5)	298
Easton, (C3)	206
E. Prairie, (O9)	1,124
Edgerton, (C4)	558
Edina, (H2)	1,438
Edinburg, (E8)	200
Eldon, (G6)	2,636
Eldorado Springs, (E7)	2,212
Ellington, (L8)	452
Elliott, (G4)	200
Ellisnore, (L9)	350
Elmer, (G3)	349
Elmo, (B1)	309
Elsberry, (L4)	1,255
Elvins, (M7)	2,418
Eminence, (K8)	325
Eolia, (L4)	343
Essex, (N9)	589
Esther, (M7)	800
Ethel, (G3)	329
Eureka, (L5)	500
Everton, (E8)	463
Ewing, (J2)	384
Excelsior, (G6)	4,165
Excelsior Springs, (D4)	4,200
Exeter, (E9)	399
Fairfax, (B2)	704
Fairmont, (J2)	300
Fairplay, (E7)	486
Fairport, (D3)	250
Fairview, (D9)	378
Farber, (J4)	363
Farmington, (M7)	2,685
Fayette, (G4)	2,381
Fayetteville, (E5)	200
Federal, (L7)	771
Ferguson, (M5)	1,874
Festus, (M6)	3,348
Fillmore, (C2)	272
Fisk, (M9)	466
Flat River, (M7)	5,112
Fleming, (D4)	650
Flemington, (F7)	250
Florida, (J4)	200
Florisant, (M5)	682
Foley, (L4)	227
Forbes, (B3)	300
Fordland, (G8)	248
Forest City, (B2)	593
Forest Park, (E9)	432
Foristell, (L5)	250
Fornfelt, (N8)	1,819
Forsyth, (F9)	200
Fortuna, (G5)	203
Foster, (C6)	344
Frankclay, (L7)	350
Frankford, (K4)	653
Franklin, (G4)	314
Fredericktown, (M7)	3,124
Freeburg, (J6)	292
Freeman, (C5)	299
Freistatt, (E8)	250
Frisco, (N9)	200
Frohna, (N7)	200
Fruitland, (N8)	230
Fulton, (J5)	5,595
Gainesville, (G9)	256
Galena, (E9)	390
Gallatin, (D3)	1,747
Galt, (F2)	587
Garden City, (D5)	711
Gentry, (D2)	217
Gentryville, (D2)	250
Gerald, (K6)	246
Gibbs, (H2)	217
Gibson, (A9)	252
Gideon, (N10)	1,197
Gilliam, (F4)	404
Gilman City, (E2)	618
Glasgow, (G4)	1,351
Glendale, (M5)	749
Glenwood, (G1)	290
Golden, (E9)	899
Golden City, (D8)	882
Goodman, (D9)	321
Gower, (C3)	418
Graham, (C2)	317
Grain Valley, (D5)	354
Granby, (D9)	1,736
Grandin, (L9)	700
Grand Pass, (F4)	200
Grandview, (D5)	410
Granger, (H2)	189
Graniteville, (L7)	400
Grant City, (D1)	1,305
Gray Summit, (L6)	240
Greencastle, (G2)	487
Green City, (F2)	905
Greenfield, (E8)	1,440
Greenridge, (F5)	382
Greentop, (H2)	289
Greenville, (M8)	614
Greenwood, (D5)	300
Guilford, (C2)	273
Hale, (F3)	690
Hallsville, (H4)	225
Hamburg, (L5)	200
Hamilton, (E3)	1,689
Hannibal, (K3)	19,306
Hardin, (E4)	847
Harris, (F2)	370
Harrisonville, (D5)	2,073
Hartsburg, (H5)	211
Hartshorn, (J8)	250
Hartville, (H8)	521
Harwood, (D7)	215
Hawk Point, (K4)	256
Hayti, (B9)	1,507
Helena, (C3)	200
Hematite, (L6)	300
Henderson, (G8)	200
Hendrickson, (L9)	200
Henrietta, (E4)	630
Herculaneum, (M6)	900
Hermann, (K5)	1,701
Hermitage, (F7)	300
Hickman Mills, (C5)	200
Higbee, (G4)	1,400
Higginsville, (E4)	2,724
High Hill, (K5)	253
Highpoint, (G6)	190
Hillsboro, (L6)	205
Hillside, (M5)	250
Hinton, (H4)	180
Holcomb, (B9)	358
Holden, (E5)	2,011
Holland, (B9)	530
Holliday, (H3)	260
Hollister, (F9)	309
Holstein, (K5)	400
Holt, (D4)	398
Hopewell Academy, (K5)	260
Hopkins, (C1)	918
Hornersville, (B9)	647
Hough, (N9)	250
Houston, (J8)	772
Houstonia, (F5)	407
Hughesville, (F5)	200
Humansville, (E7)	947
Hume, (C6)	542
Humphreys, (F2)	359
Hunnewell, (J3)	348
Huntsdale, (H5)	91
Huntsville, (H3)	2,126
Hurdland, (H2)	325
Iantha, (D7)	250
Iberia, (H6)	487
Idalia, (N9)	200
Illmo, (O8)	1,275
Independence, (D4)	11,686
Irondale, (L7)	455
Ironton, (L7)	832
Jackson, (N8)	2,114
Jacksonville, (H3)	275
Jameson, (E2)	329
Jamesport, (E2)	884
Jamestown, (G5)	264
Jasper, (D8)	766
Jefferson Barracks, (M5)	800
JEFFERSON CITY, (H5)	14,490
Jennings, (M5)	800
Jerico Springs, (E7)	262
Jonesburg, (K5)	473
Joplin, (C8)	29,902
Josephville, (L5)	260
Kahoka, (J2)	1,624
Kansas City, (C5)	324,410
Kearney, (D4)	625
Kelso, (N8)	228
Kennett, (B9)	3,622
Keota, (G3)	750
Keytesville, (G4)	872
Kidder, (D3)	335
King City, (C2)	1,150
Kingston, (E3)	371
Kingsville, (E5)	214
Kinloch, (M5)	350
Kirksville, (H2)	7,213
Kirkwood, (L5)	4,422
Knoblick, (M7)	260
Knobnoster, (E5)	617
Knobview, (J6)	260
Knox City, (J2)	400
Koeltztown, (H6)	250
Koshkonong, (J9)	414
Labaddie, (L5)	250
Labelle, (J2)	878
Laclede, (F3)	649
Laddonia, (J4)	580
La Due, (E6)	310
Lagrange, (J2)	1,114



Hammond's 8 x 11 Map of Missouri
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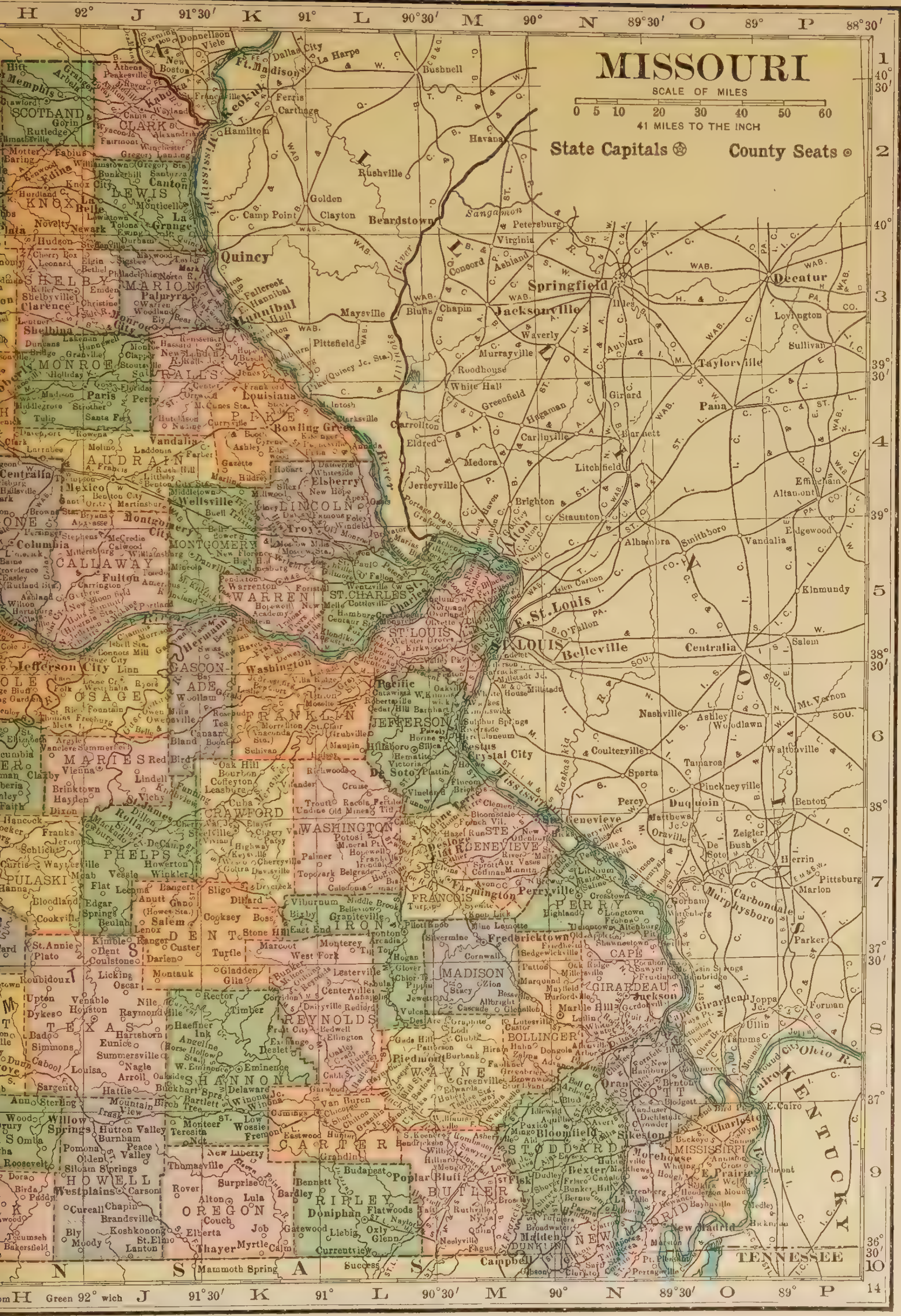
MISSOURI
SCALE OF MILES
0 5 10 20 30 40 50 60
41 MILES TO THE INCH
State Capitals ⊛
County Seats ⊙
ILLINOIS
KENTUCKY
TENNESSEE
Mississippi R.
Ohio R.
St. Louis
E. St. Louis
Springfield
Jefferson City
Quincy
Hannibal
Cairo
Green 92° wich
H 92° J 91°30′ K 91° L 90°30′ M 90° N 89°30′ O 89° P 88°30′

MISSOURI - Cont'd.

Lamar, (D8)	2,255
Lamonte, (F5)	595
Lancaster, (H1)	859
Laplata, (H2)	1,463
Laredo, (F2)	728
Latham, (G5)	250
Lathrop, (D3)	1,100
Lawson, (D4)	545
Leadwood, (L7)	700
Leasburg, (K6)	200
Lebanon, (G7)	2,848
Lecoma, (J7)	200
Leeper, (L8)	500
Lees Summit, (D5)	1,467
Leeton, (E5)	463
Leonard, (H3)	231
Leslie, (K6)	162
Lesterville, (L8)	250
Lewistown, (J2)	483
Lexington, (E4)	4,695
Liberal, (D7)	1,160
Liberty, (D4)	3,007
Licking, (J8)	411
Lilbourn, (N9)	986
Lincoln, (F6)	345
Linden, (C4)	200
Linn, (J5)	441
Linncreek, (G6)	431
Linneus, (F3)	814
Livonia, (G1)	248
Lock Spring, (E3)	288
Lockwood, (E8)	967
Longtown, (N7)	162
Longwood, (F5)	200
Louisiana, (K4)	4,060
Lowry City, (E6)	509
Low Wossie, (K9)	180
Lucerne, (F2)	316
Ludlow, (E3)	380
Luray, (J2)	164
Lutesville, (M8)	585
McCredie, (J5)	200
McFall, (D2)	447
Macon, (H3)	3,549
Madison, (H4)	646
Maitland, (B2)	716
Malden, (M9)	2,098
Malta Bend, (F4)	442
Manchester, (L5)	630
Mansfield, (G8)	757
Maplewood,(M5)	7,431
Marblehill, (N8)	332
Marceline, (F3)	3,760
Marionville, (F9)	1,167
Marquand, (M8)	352
Marshall, (F4)	5,200
Marshfield, (G8)	1,371
Marston, (N9)	438
Marthasville, (K5)	500
Martinsburg, (J4)	510
Maryville, (B2)	4,711
Matthews, (N9)	378
Maysville, (D3)	1,057
Mayview, (E4)	406
Maywood, (J3)	250
Meadville, (F3)	616
Mehlville, (M5)	340
Melbourne, (E2)	159
Memphis, (H2)	1,941
Mendon, (F3)	387
Mendota, (F1)	500
Mercer, (E1)	442
Merwin, (C6)	171
Meta, (H6)	426
Metz, (D6)	210
Mexico, (J4)	6,013
Miami, (F4)	372
Middletown,(J4)	279
Midland, (M5)	300
Milan, (F2)	2,395
Milford, (D7)	250
Millard, (G2)	170
Miller, (E8)	536
Millgrove, (F2)	182
Millspring, (L8)	230
Mindenmines,(D8)	924
Mine Lamotte,(M7)	400
Mineola, (J5)	170
Mineralpoint, (L7)	258
Mirabile, (D3)	250
Missouri City, (D4)	292
Moberly, (H4)	12,808
Mokane, (J5)	726
Monarch, (L5)	250
Monett, (E9)	4,206
Monroe City,(J3)	1,941
Montgomery City, (J4)	1,688
Monticello, (J2)	244
Montrose, (E6)	715
Mooresville, (E3)	193
Morehouse, (N9)	1,913
Morley, (N8)	599
Morrison, (J5)	336
Morrisville, (F8)	425
Moscow Mills,(K5)	348
Moselle, (L6)	160
Mound City,(B2)	1,472
Moundville, (D7)	240
Mountaingrove, (H8)	2,212
Mountainview, (J8)	1,058
Mt. Moriah, (F2)	331
Mt. Pleasant, (M5)	500
Mt. Vernon, (E8)	1,254
Mt. Washington, (C4)	1,700
Naylor, (L9)	681
Neck, (C8)	241
Neelyville, (M9)	237
Nelson, (G4)	639
Neosho, (D9)	3,968
Nettleton, (E3)	200
Nevada, (D7)	7,139
Newark, (J2)	220
New Bloomfield, (J5)	300
Newburg, (J7)	1,235
New Cambria, (G3)	313
New Florence, (K5)	600
New Frankfort, (F4)	250
New Franklin, (G4)	848
New Hampton, (D2)	519
Newhaven, (K5)	805
Newhope, (L4)	160
New London, (J3)	911
New Madrid, (O9)	1,908
New Melle, (L5)	250
New Offenburg, (M7)	350
Newtonia, (D9)	206
Newtown, (F2)	408
Niangua, (G8)	283
Nichols, (F8)	200
Nixa, (F8)	370
Noel, (D9)	324
Norborne,(E4)	1,180
Normandy, (M5)	200
No. Kansas City,(C4)	870
Norwood, (H8)	250
Novelty, (H2)	277
Novinger, (G2)	1,743
Oakgrove, (D5)	634
Oakridge, (N8)	274
Oakville, (M6)	500
Oakwood, (K3)	400
Odessa, (E5)	1,786
O'Fallon, (L5)	588
Ohlman, (K8)	180
Old Mines, (L6)	400
Old Monroe, (L5)	317
Old Orchard, (M5)	2,500
Olivette, (M5)	300
Olney, (K4)	170
Oran, (N8)	1,141
Oregon, (B3)	904
Oronogo, (D8)	981
Orrick, (D4)	632
Osage City, (J5)	220
Osborn, (D3)	354
Osceola, (E6)	1,025
Osgood, (F2)	272
Oskaloosa, (C7)	331
Otterville, (F5)	482
Overland, (M5)	500
Owensville, (J6)	777
Oxly, (L9)	200
Ozark, (F8)	798
Pacific, (L6)	1,275
Palmyra, (J3)	1,964
Panama, (D6)	400
Paris, (J4)	1,431
Parkville, (C4)	619
Parma, (N9)	1,241
Parnell, (C2)	473
Pascola, (B9)	441
Patton, (M8)	200
Pattonsburg, (D2)	1,068
Paynesville, (L4)	370
Peculiar, (C5)	223
Perry, (J4)	838
Perryville, (M7)	1,763
Phelps, (E8)	170
Phenix, (E8)	450
Philadelphia, (J3)	199
Phillipsburg, (G7)	248
Pickering, (C2)	314
Piedmont, (L8)	1,086
Pierce City, (E9)	1,476
Pilot Grove, (G5)	753
Pilot Knob, (L7)	445
Pine Lawn, (M5)	200
Pineville, (D9)	359
Platte City, (C4)	558
Plattsburg, (D3)	1,719
Pleasant Hill, (D5)	1,965
Pleasant Hope, (F8)	300
Pocahontas, (N8)	156
Pollock, (F2)	200
Polo, (D3)	606
Pomona, (J9)	200
Ponce de Leon, (F9)	250
Poplar Bluff, (L9)	8,042
Portage Des Sioux, (M5)	283
Portageville, (N10)	1,244
Portland, (J5)	280
Potosi, (L7)	984
Powe, (M9)	187
Powersville, (F1)	356
Prairie Hill, (G3)	192
Prairie Home, (G5)	255
Princeton, (F2)	1,576
Prosperity, (D8)	700
Purcell, (D8)	603
Purdin, (F3)	355
Purdy, (E9)	442
Puxico, (M9)	877
Queen City, (H2)	697
Quincy, (F6)	190
Quitman, (B2)	195
Qulin, (M9)	500
Ravanna, (F2)	197
Ravenwood, (C2)	344
Raymore, (D5)	182
Reeds, (D8)	200
Reeds Spring, (F9)	300
Reger, (F2)	250
Rembert, (G8)	250
Renick, (H4)	218
Republic, (F8)	1,097
Revere, (J1)	187
Reynolds, (K8)	250
Rhineland, (J5)	172
Richards, (C7)	359
Richhill, (D6)	2,261
Richland, (H7)	955
Richmond, (E4)	4,409
Richmond Heights, (M5)	2,136
Richwoods, (L6)	180
Ridgeway, (D6)	812
Ritchey, (D9)	356
River Aux Vases, (M7)	170
Rocheport, (G5)	458
Rochester, (C3)	200
Rockport, (B2)	1,136
Rockville, (E6)	486
Rocky Comfort, (D9)	300
Rogersville, (F8)	408
Rolla, (J7)	2,077
Rombauer, (M9)	200
Rosebud, (K6)	200
Rosendale, (C2)	329
Rothville, (F3)	220
Rushville, (B3)	262
Russellville, (G5)	364
Rutledge, (H2)	283
St. Charles, (L5)	8,503
St. Clair, (L6)	442
Ste. Genevieve, (N7)	2,046
St. Francois, (M7)	1,400
St. James, (J6)	1,117
St. John, (F1)	190
St. Joseph,(B3)	77,939
St. Louis, (M5)	772,897
St. Marys, (N7)	722
St. Paul, (L5)	200
St. Peters, (L5)	358
Salem, (D2)	367
Salem, (J7)	1,771
Salisbury, (G4)	1,757
Santa Rosa, (D3)	160
Sarcoxie, (D8)	1,023
Savannah, (C3)	1,831
Schell City,(D6)	596
Sedalia, (F5)	21,144
Seligman, (D9)	400
Senath, (A9)	1,054
Seneca, (C9)	1,104
Seymour, (G8)	751
Shelbina, (H3)	1,809
Shelbyville, (H3)	690
Sheldon, (D7)	544
Sheridan, (C1)	418
Shrewsbury, (M5)	845
Sibley, (D4)	200
Sikeston, (N9)	3,613
Silex, (K4)	267
Skidmore, (C2)	628
Slater, (G4)	3,797
Sligo, (K5)	300
Smithfield, (C8)	500
Smithton, (F5)	331
Smithville, (D4)	782
Snyder, (F3)	186
So. Gifford, (G3)	168
So. Gorin, (H2)	426
So. Greenfield,(E8)	258
South West City, (C9)	577
Sparta, (F9)	257
Spickard, (E2)	731
Spoonerville,(A9)	237
Springfield, (F8)	39,631
Spurgeon, (D9)	250
Stahl, (G2)	300
Stanberry, (C2)	1,864
Stark City, (D9)	190
Steele, (B9)	751
Steelville, (K7)	767
Stella, (D9)	180
Stewartsville, (D3)	534
Stockton, (E7)	696
Stotts City,(E8)	354
Stoutland, (G7)	300
Stoutsville, (J3)	247
Stover, (G6)	447
Strafford, (F8)	300
Strasburg, (D5)	171
Stratmann, (M5)	250
Sturgeon, (H4)	728
Sugar Creek, (D4)	500
Sullivan, (K6)	909
Sulphur Sprs., (M6)	200
Summersville, (J8)	286
Sumner, (F3)	468
Sweet Springs, (F5)	1,177
Syenite, (M7)	200
Syracuse, (G5)	288
Tarkio, (B2)	1,870
Tebbetts, (J5)	200
Thayer, (K9)	1,738
Tina, (F3)	364
Tipton, (G5)	1,170
Tracy, (C4)	196
Trenton, (E2)	6,951
Triplett, (F4)	337
Troy, (K5)	1,116
Truxton, (K4)	280
Turney, (D3)	212
Tuscumbia, (H6)	256
Tuxedo, (M5)	800
Tyler, (B9)	180
Union, (L6)	1,605
Uniondale, (M5)	1,315
Union Star, (C3)	434
Uniontown, (N7)	210
Unionville, (F1)	1,765
University, (M5)	6,792
Urich, (D6)	538
Utica, (E3)	500
Valleypark, (L5)	899
Vanburen, (L8)	400
Vandalia, (J4)	2,158
Vanduser, (N9)	326
Verona, (E9)	438
Versailles, (G6)	1,651
Vichy, (J6)	200
Victoria, (L6)	190
Vienna, (J6)	300
Vista, (E7)	200
Waco, (C8)	368
Wakenda, (F4)	292
Waldron, (C4)	160
Walker, (D7)	309
Wallace, (C3)	160
Walnut Grove,(E8)	403
Wappapello, (M8)	180
Warrensburg, (E5)	4,311
Warrenton, (K5)	800
Warsaw, (F6)	925
Washburn, (E9)	219
Washington,(K5)	3,132
Watson, (A1)	227
Waverly, (E4)	810
Wayland, (J2)	355
Waynesville, (H7)	293
Weatherby, (D3)	220
Weaubleau, (F7)	413
Webb City,(C8)	7,807
Webster Groves, (L5)	9,474
Wellington, (E4)	878
Wellston, (M5)	7,312
Wellsville, (K4)	1,551
Wentworth, (D8)	267
Wentzville, (L5)	514
Westalton,(M5)	300
Westboro, (B1)	311
West Eminence, (K8)	500
Weston, (C4)	991
Westphalia, (H6)	234
Westplains,(J9)	3,178
Wheatland, (F7)	400
Wheaton, (E9)	374
Wheeling, (F3)	490
Whiteoak, (B9)	250
Whiteside, (L4)	166
Whitesville, (C2)	290
Whitewater, (N8)	284
Whitham, (F3)	250
Whiting, (O9)	242
Willard, (F8)	160
Williamstown, (J2)	254
Williamsville, (M9)	448
Willow Springs, (H9)	1,441
Winchester, (J2)	150
Windsor, (E5)	2,034
Winfield, (L5)	418
Winigan, (G2)	170
Winona, (K8)	359
Winston, (D3)	339
Wittenberg, (O7)	269
Wooldridge, (G5)	160
Woolam, (J6)	160
Worth, (D2)	201
Worthington, (G2)	327
Wright City, (K5)	402
Wyaconda, (J2)	659
Yates, (G4)	350
Zalma, (M8)	259

Of the entire number of farms in 1920, 185,030, or 70.4 per cent, were operated by owners, 2,247, or 0.9 per cent, by managers and 75,727, or 28.8 per cent were operated by tenants. In the same year there were 260,178 white farmers, of whom 251,835 were natives and 8,343 foreign-born. Of the latter 4,328 came from Germany, 555 from England, 492 from Switzerland, 425 from Austria, 411 from Sweden, 365 from Ireland and 296 from Canada. Colored farmers numbered 2,826 in 1920, of whom all but two — one Chinese and one Indian — were negroes. Negroes farmed 190,368 acres of which 141,963 acres were improved land. The value of the land and buildings of the negro farms aggregated $16,524,007.

Lumber.— Missouri is one of the few middle States that yet markets ties, lumber, laths and shingles in large quantities. The State annually markets about 10,000,000 railroad ties, worth about $4,000,000 to the producer. More than 1,000 sawmills had an output of 60,159,000 feet of lumber in one year, according to the last census report, the approximate value of which was, in round numbers, $30,000,000. This production, however, has now begun to diminish.

Mineral Resources.—Missouri has the largest deposits of lead, zinc, coal and clay of the Middle Western States. The principal lead district is in southeastern Missouri in Saint Francis, Madison and Washington counties, but an important production of lead is made in the Joplin zinc district of southwestern Missouri. The lead, in the form of mineral galena, occurs disseminated through the sedimentary rocks of the region, especially in the dolomites of the Bonne Terre formation of the Cambrian Age. The average ore contains about 3.5 to 4 per cent of lead, but the large scale upon which the deposits are worked gives a good profit. This district is one of the most important lead-producing areas in the world. Lead was discovered in southeastern Missouri about 1720 and the region has produced the mineral more or less continuously ever since. Missouri's total production of lead is about $15,000,000 annually, the larger part of which comes from the southeastern district. In the war years the production reached the value of $32,000,000. The chief ore mineral of zinc in the Joplin district is sphalerite, or zinc blende, but there is also an important production of zinc, silicate, calcimine and zinc carbonate, smithsonite. The ores are found in runs or circles and in sheet ground of limestone. The runs and circles may be 10 to 50 feet wide and are respectively shallow. The sheet ground may be from 10 to 70 feet thick and reaches a depth of 200 feet. The high price of both lead and zinc, during the war, stimulated the mining industry and led to the opening up and development of new areas, as well as the extension of the older ones. The clay resources of Missouri are large and especially suited for the manufacture of common and fancy brick, tile, sewer-pipe, fire-brick and terra-cotta. While clays are found in all parts of the State, they are not all equally adapted to the specific uses given above. Missouri ranked ninth in this industry in the United States in 1921. Missouri originally had an estimated available tonnage of 79,362,000,000 tons of coal. Since 1840, which is the first recorded production, 115,000,000 tons have been mined and an additional 60,000,000 tons destroyed in mining the above quantity, thus leaving about 79,187,000,000 tons, of which not more than 60 per cent will be recovered. The coal occurs in the lower part of the Pennsylvania formation. The beds are rarely over four feet and most of those mined average about three feet or less. The Bevier bed furnishes about 60 per cent of the coal in Missouri. Other important coal-producing centres are at Rich Hill and Lexington. Missouri has long been famous for her «iron mountain,» but the total amount of iron produced at this locality was only about 4,000,000 tons. There are many scattered deposits of hematite and limonite over the Ozark region. Missouri's total production is probably not more than 10,000,000 tons. The State also has many excellent building stones, notably the granite of southeastern Missouri and the limestone at Carthage and Phœnix, as well as stones in other parts of the State. Missouri has produced 42 per cent of the annual production of baryte for the United States for many years and still has large reserves of this valuable mineral in Washington and other counties of the State.

PRODUCTION AND VALUE OF THE CHIEF MINERAL INDUSTRIES

NO. ENTERPRISES 1920	Capital	Wages	Value of products
468	$47,926,850	$16,777,353	$33,365,694
Lead and zinc, 93	26,758,399	5,955,929	15,879,177
Coal, 179	11,788,513	8,156,952	12,077,845
Limestone, 70	2,447,811	1,181,826	2,355,736
Clay, 41	1,963,503	650,555	1,420,585
Barytes, 66	1,200,611	399,725	527,817

MINERAL	Production 1922	Value, 1922
Portland cement	6,239,144 bbls.	$10,457,557
Clay	....	10,668,691
Barytes	66,421 s. tons	421,568
Coal	2,700,000 tons	9,660,000
Lead and zinc	184,000 tons	17,975,000

Manufactures.— Outside the city of Saint Louis, the leading manufacturing counties are Jackson, Buchanan, Saint Charles, Marion, Jasper, Franklin, Greene, Cole, Cape Girardeau, Platte, Pike, Ralls, Boone and Lafayette. According to the summary of the United States Census Bureau for 1919, the value of the manufactured products of the State was $1,594,208,338 and the number of persons engaged in manufacturing, 244,939. Saint Louis is the largest manufacturing centre of the State. The chief manufacturing industries of that city, according to the report of the Census Bureau, are:

Slaughtering and meat packing	$96,044,220
Boots and shoes	59,857,853
Tobacco in various forms	45,947,990
Foundries and machine shops	31,493,878
Boot and shoe cut stock	28,696,415
Bags, other than paper	27,970,073
Coffee, roasting and grinding	21,956,572
Clothing, men's	21,135,292
Bread and bakery products	21,047,650
Clothing, women's	17,415,571

Next in importance as manufacturing cities are Kansas City and Saint Joseph. The valuation of the manufactured products of Kansas City in 1919 totaled $192,815,052, including:

Bakeries	$15,762,836
Printing and publishing (newspapers)	10,592,983
Butter	7,879,726
Flour and grist mills	7,611,780
Printing, book and job	6,715,257
Coffee roasting, etc	6,393,929
Men's clothing	6,048,192
Food preparations	5,839,526
Cars and general shop construction	3,840,304

In 1919 the value of products in Saint Joseph was $50,697,198, principal among which is the flour-milling industry. Here is a partial list of the most important industries:

Flouring and grist-mill products	$19,106,839
Confectionery and ice cream	5,550,754
Boots and shoes	2,020,617
Men's clothing	1,565,460

Springfield, Joplin and Hannibal lead in manufacturing among the smaller cities of the State.

The following partial list of factory products shows the varied character of the manufacturing industry: Cob pipes, pearl buttons, soap, glass, musical instruments, lime, electrical instruments, spelter, zinc oxide, white lead, drugs, street and railway cars, motor vehicles, rubber goods, flags and banners, books, furniture, brick, tile, bed springs, stoves, cement, dynamite, coffins, surgical and mathematical instruments, chemicals, dyes, engines, boilers, farm implements, carriages, wagons, stoneware, pottery, paper, paint, clothing, leather goods, millinery, wire, gas, jewelry, confectionery, food preparations, brooms and brushes.

Finances.— In 1922, according to the records of the State auditor, the assessed valuation of all taxable property in Missouri was $4,268,965,656. The bonded debt of the State, 1 Jan. 1913, was $3,500,000 — bonds issued to erect a new capitol. The rate of taxation in 1915 was two cents on the $100 for the capitol, one cent for the school certificates of indebtedness, five for the public schools and 10 for all other purposes. The bonded debt of the State on 1 July 1922 was $20,298,839. According to the Council of the Corporation of Foreign Bondholders the State has a defaulted debt of about $7,000,000, the remnant of the $27,370,000 railroad debt assumed by the State in 1862, after the disastrous era of speculative railroad construction. In 1921 the State revenue amounted to $32,086,559 and the expenditures to $29,732,403. On 1 Jan. 1922 the treasurer had a balance on hand of $14,803,186.

Banks.— There are 135 national banks in Missouri, according to the official manual of the State for 1922, with a total of demand deposits of $461,762,000, and over 30,000 depositors. The incorporated State banks number 1,409 and have individual deposits of $615,182,000. There are also private banks and, in the larger cities, 104 trust companies with individual deposits aggregating $252,146,000. The aggregate resources of the 104 loan and trust companies amounted to $365,983,000 on 30 June 1922.

In the year 1872 there were 58 banks in the State with a capital and surplus of $20,196,098, showing that during the last 50 years the number of banks and their capital and surplus has increased many times. Missouri is the only State in the Union which has two Federal Reserve banks, one located at Saint Louis and the other at Kansas City.

Railroads.— Many of the important trunk lines of the United States traverse the State of Missouri and other systems connect with them giving excellent transportation facilities to the northern parts of the State, but there are a few counties of the southern tier without railway. Approximately 30 railroads have their entrance into the Union station of Saint Louis and about 20 into Kansas City's Union station. In addition to these, many electric roads and branch lines have been constructed or are in the process of construction throughout the State. The leading trunk lines with eastern branches are the Wabash, the Pennsylvania, Baltimore and Ohio and the Big Four. Running directly to Chicago are the Illinois Central, Chicago and Alton, Chicago, Burlington and Quincy, Wabash, Rock Island and the Santa Fé. Feeding the West and Southwest are the Santa Fé, the Missouri Pacific, the Union Pacific, the Wabash, the Missouri, Kansas and Texas, the Chicago, Burlington and Quincy, the Frisco and the Rock Island. River transportation, which was neglected for many years following the Civil War, is now being developed and large quantities of cereals and other products are taken from Saint Louis to New Orleans by river and transferred to ocean-going liners. The Missouri is open to merchant crafts from Saint Louis to Kansas City. There are 66 railroad systems in the State, with 8,193 miles of main track and 26 electric roads with 1,166 miles.

Education.— The public school system of education in Missouri was adopted in 1839. The system consists of district schools, graded and ungraded; city schools, graded and with high school courses; five normal schools, Lincoln Institute for negroes and the University of Missouri. The University of Missouri is supported by what is designated as a permanent endowment consisting of certificates of indebtedness amounting to $1,235,839, and by appropriations from the general assembly.

Free schools are required for children, white and negro, between the ages of 6 and 20 years in every district in the State. Besides these State schools, there are also many private institutions for both sexes. Among the larger institutions of this kind are Saint Louis University, founded in 1829, under the control of the Jesuit order of the Roman Catholic Church, with buildings worth approximately $1,000,000; Washington University, Saint Louis, which has an endowment fund of several millions of dollars; William Jewell College at Liberty, a Baptist school; Drury College, Springfield, Congregational; Central College, Fayette, Southern Methodist; Westminster College, Fulton, Presbyterian; Missouri Wesleyan, Cameron, Northern Methodist; Missouri Valley College, Marshall, Presbyterian; Hardin College, Mexico, Baptist; William Woods, Fulton, Christian; Stephens, Baptist, and Christian, Christian, Columbia; Lindenwood, Saint Charles, Presbyterian; Christian University, Canton, and other smaller institutions.

According to the last Federal census there were within the State 83,403 illiterates of 10 years and over, a percentage of illiteracy of 3.0. Among native whites of native parentage the

State Capitol at Jefferson City

percentage was 2.0, among native whites of foreign parentage, 9.6, and among Afro-Americans, 12.1. In 1922 the total public school enrolment was 672,483, and the average daily attendance was 93.4 of this number; there were in the same year 21,126 teachers. Teachers received an average annual salary of $797 in the school year of 1919–20, and $28,048,051 were expended on education.

Religion.— Missouri's earliest settlers were Roman Catholics. The first Protestant church was the Christ Church (Protestant Episcopal) which was founded in Saint Louis in 1819. Soon after various religious bodies established themselves in various parts of the State. The Roman Catholic Church has retained its strength in the cities and towns along the great rivers, and its members are numerous throughout the entire State. The Methodists (Northern and Southern), the Disciples of Christ, the Baptists, the Presbyterians and the Episcopalians are the leading Protestant churches. Each of these churches supports a college with the exception of the Episcopalian. The Roman Catholic has one large university, a number of preparatory schools and many parochial schools located largely in the cities.

Government.— The present constitution of the State was adopted by popular vote in 1875 after it had been framed and recommended by a convention called for that purpose. The general assembly of the State, consisting of the senate and house of representatives, meets biennially on the Wednesday after the first day of January following the election of the members. The senate is composed of 34 members and the house 142. The pay of the members is not to exceed $5 a day for 70 days and if the session is further prolonged, an allowance of $1 a day is made until the body adjourns. The members are also allowed mileage to and from the meetings of the assembly. In the executive department are the governor, the lieutenant-governor, the secretary of state, the state auditor, the state treasurer, the attorney-general and the superintendent of public schools. The governor, in whom is vested supreme executive power, is chosen for four years, as are all of the other members of the executive department. The governor is given a qualified veto upon acts of the assembly. The judicial system of the State is composed of the Supreme Court, the Saint Louis, Kansas City and Springfield courts of appeals, the circuit courts, criminal courts, probate and municipal courts. The judges and officers of the Supreme Court are elected for a term of 10 years; of the Saint Louis and Kansas City courts of appeals for a term of 12 years and of the circuit courts of the State for six years. The house of representatives is given the sole power of impeachment of executive and judicial officers. The senate tries all cases of impeachment. Every male citizen of the United States and every male person of foreign birth who may have declared his intention of becoming a citizen of the United States according to law, not less than one year and not more than five years before he offers to vote, who is over the age of 21 years, is entitled to vote at all elections by the people if he has resided in the State one year immediately preceding the election, and has resided in the county, city or town where he shall offer to vote at least 60 days immediately preceding the election. In 1908 the initiative and referendum were adopted by constitutional amendment. Capital punishment was abolished in 1917.

Charitable and Penal Institutions.— The State of Missouri has four hospitals for the care of the insane, a colony for the feeble-minded and epileptic, a State sanitorium for the tubercular, a school for the deaf and dumb and a school for the blind as its charitable institutions maintained by appropriations and the labor of the persons within them. The penal institutions are a penitentiary, a reform school for boys, and girls' industrial school and an industrial school for negro girls. In addition to these, the State maintains a home for Federal and a home for Confederate veterans. The hospitals for the insane are located at Fulton, Saint Joseph, Nevada and Farmington, and have a total property valuation of approximately $2,725,000. Marshall is the home of the colony for the feeble-minded and epileptic. The State sanitorium for the tubercular was established in 1905 at Mount Vernon, Lawrence County, on the crest of the Ozark Mountains. The 48th assembly appropriated $175,700 for the use of the institution. The school for the deaf and dumb is located at Fulton and has 300 students who are given an industrial training peculiar to their needs. The school for the blind is located in Saint Louis. The penitentiary of the State is at Jefferson City and the official manual of Missouri for 1915–16 gives the total number of its prisoners, 1 April 1915, as 2,585 males and 55 females. Its property valuation is $1,987,113.87. The reform school for boys at Boonville has 339 inmates. At Chillicothe is the industrial school for girls which has 225 girls in its care. The State industrial school for negro girls was established at Tipton, 14 June 1909, by an act which appropriated $20,000 for its beginning. A total appropriation of $199,742.19 has been made for the completion of the buildings of the school and the support of the institution. The Confederate veterans home is at Higginsville. The Federal soldiers home is at Saint James and has 296 veterans who make their home there. According to the last census there were 2,388 paupers in almshouses, being 72.5 per 100,000 of population, and 3,523 prisoners in penal institutions, being 107 per 100,000 of population.

Politics.— Missouri for more than 30 years has been usually a Democratic State. The vote of the State for presidential electors in 1880 was: Democratic, 208,609; Republican, 155,567; other parties about 80,000. In 1892 the Democratic vote was 268,398; Republican, 226,918. In 1908, however, the Democratic vote was 346,574; the Republican, 347,203. In 1912 the Democratic vote was 330,746; Republican 207,821; Progressive, 124,821. In 1916 the Democratic presidential vote was 398,032 and the Republican, 369,339. In 1920, the Democratic presidential vote was 574,799; Republican, 727,162.

Population.—The State of Missouri is composed of 114 counties and the city of Saint Louis. The number of the inhabitants of the State since 1850 is shown in table on following page.

The 1920 census of the United States gives the foreign-born white population of the State as 186,026. There were also 178,241 persons of negro descent. The early settlers of the State were foreign, coming from France, and the population of what is now Missouri remained French for 50 years after the first settlement. Many descendants of these earlier French families are to be found in Saint Louis and other of the older river towns. A large part of the population of the State is of German extraction having settled especially in Saint Louis and along the Missouri River. A large percentage of the population is also composed of Irish, 15,022; English, 10,400; Canadians, 6,503; Swiss, 4,934; Russians, 18,769, and 4,741 Swedes. The native American population until a generation ago was mostly descended from immigrants from the States of Kentucky, Tennessee, North Carolina and Virginia, but during the last 40 years a large accession of the population has come from the Eastern and Northwestern States. Saint Louis, the largest city in the State and one of the most important in the Mississippi Valley, had a population of 772,897 according to the 1920 official census. Kansas City, the next largest city in the State on its western border, had a population of 324,410, and is growing more rapidly than any other city in the State. Saint Joseph, in the northwestern part of the State, is given by the same census a population of 77,939; Hannibal, a river town in the eastern part of the State, 19,306; Springfield, in the central southern portion, 39,631; Joplin, in the extreme southwestern part of the State, 29,902; Sedalia, in the central part of the State, 21,144; Jefferson City, the capital, 14,490.

YEAR	Males	Females	Total	Density per square mile
1850...	357,832	324,212	682,044	14.37
1860...	622,201	559,811	1,182,012	18.08
1870...	896,347	824,948	1,721,295	26.34
1880...	1,127,187	1,041,193	2,168,380	31.55
1890...	1,385,238	1,293,946	2,679,184	39
1900...	1,595,710	1,510,955	3,106,665	45.2
1910...	1,687,813	1,605,522	3,293,335	47.9
1920...	1,723,319	1,680,736	3,404,055	49.5

History.— Missouri is a part of the territory taken possession of by the French adventurer and discoverer, La Salle, 9 April 1682, which he named Louisiana in honor of the reigning king, Louis XIV, of France. The exact dates of the first settlements are unknown. Some historians give 1763 as the date of the first settlement and others, supported by traditions, place it as early as 1735. Saint Louis was settled by Pierre Laclede Liguest, a Frenchman. The site was selected in 1763, and in 1764 August Choteau, at the order of Liguest, began the erection of a village. Other earlier settlements were for years confined to the banks of the rivers. The French governor's official residence to 1701 was at Fort Biloxi; from 1701 to 1723 at Mobile, and then at New Orleans. On 3 Nov. 1762, France ceded Louisiana to Spain, but the Spanish authorities did not take possession of Upper Louisiana, of which Saint Louis was the capital, till 20 May 1770. Spain retroceded Louisiana to France by treaty of 1 Oct. 1800, ratified 21 March 1801, but the actual transfer of Upper Louisiana was not made until 9 March 1804. France ceded for a cash consideration the province of Louisiana to the United States, 30 April 1803, the actual transfer of Upper Louisiana being made at Saint Louis on 10 March 1804. Under act of Congress, approved 31 Oct. 1803, President Thomas Jefferson appointed Wm. C. C. Claiborne (who was at the time governor of the Mississippi Territory) governor, and invested him "with the powers heretofore exercised by the Governor and Intendant of Louisiana." Governor Claiborne assumed the government at New Orleans, 20 Dec. 1803. Capt. Amos Stoddard was appointed agent and commissioner of the French republic 12 Jan. 1804. In that capacity he had received the province from Delassus at Saint Louis 9 March, and the following day delivered it to himself for the United States, having been authorized to do so by Wm. C. C. Claiborne, ex officio governor of the Territory of Louisiana. From 1 Oct. 1804, the district of Louisiana consisted of all that part of the territory purchased from France, except that portion lying south of what is now the State of Arkansas. The government was assigned to the officers of the Territory of Indiana, of which William Henry Harrison was governor until 3 March 1805. On this date the Territory of Louisiana was erected with the same limits as the district of Louisiana. The capital was Saint Louis, and from 3 March 1805, until the last part of 1806 James Wilkinson was governor. The Territory of Missouri was erected 7 Dec. 1812, and had the same limits, government and capital as the Territory of Louisiana. From 7 Dec. 1812, to July 1813, Frederick Bates was secretary and acting governor. From July 1813, to 1820 William Clark was governor. Under act of Congress, passed 6 March 1820, the State of Missouri was organized. The Constitutional Convention met in Saint Louis, 19 July 1820. The State officers assumed their duties, 19 Sept. 1820, proclamation was issued by President James Monroe, admitting Missouri as a State, 10 Aug. 1821. By act of Congress 7 June 1836, which took effect by proclamation 28 March 1837, the western boundary was extended to include the «Platte Purchase,» area of which was 3,168 square miles. The application for statehood and admission into the Union of Missouri on 8 Jan. 1818, was followed by two years of controversy which excited the entire country. The controversy raged about the question as to whether or not slavery should be permitted in Missouri. It was finally brought to an end by the admission of Missouri into the Union upon what is known as the «Missouri Compromise» (q.v.), which forbade the existence of slavery in that part of the Louisiana Purchase north of 36° 31′ except in Missouri. The constitution adopted upon the admission of the State remained practically unchanged until 1865. The first governor of the State was Alexander McNair. Saint Charles was first fixed upon as the seat of the government, but in 1826 the capital was removed to Jefferson City, where it remains. The official census of the State, taken in 1821, showed that there were 70,647 inhabitants, of whom 11,254 were slaves. The Missouri troops came in for due recognition in the Indian wars, such as the Black Hawk War of 1832, the Florida War of 1837 and afterward in the

Mexican War of 1846. Besides being a border State and a slave State as well, in all troubles preceding the outbreak of the Civil War, Missouri was deeply concerned. In many parts of the State, the sentiment was strongly in favor of secession. Governor Jackson on 3 Aug. 1861 declared that Missouri must take its stand by the side of the slave-holding States whatever they might desire to do. In a convention called to consider the affairs of the nation sentiment was found hostile to secession and the convention refused to commit the State to secession. United States troops were gathered at Saint Louis. Attempts made to take possession of the United States arsenal at Saint Louis, with its equipment, by the Secessionists were defeated and within a few months after the outbreak of the war the greater part of the State was under the control of the Federal forces. Governor Jackson declared the State out of the Union, and Confederate forces were assembled in the southwestern part of the State. The State Convention which had convened before the war again convened and declared the executive officers and the seats of the members of the general assembly vacant. The executive offices were then filled by appointment by the convention. At the battle of Wilson's Creek, near Springfield, General Lyon, who had been a strong Union leader, was killed and General Frémont, who had been placed in charge of the Department of the West, declared martial law throughout the State. At the beginning of 1862 the Confederates held nearly half of the State, but their strength gradually waned. The State furnished to the United States during the Civil War 108,773 troops, and to the Confederate army more than 50,000, keeping the State's quota full without draft or enforced enlistment not merely in one but in both armies, a record unexampled among the States North or South. In 1865 a new constitution was adopted by the people, and in 1869, by a large majority, the 15th amendment to the United States Constitution was adopted. In 1875 a convention framed and the people adopted a new State constitution, omitting many of the drastic provisions of the constitution of 1865 which had been ratified in Reconstruction days. This constitution has since been the fundamental law of the State, modified in minor details by several amendments adopted from time to time.

LIST OF GOVERNORS.

TERRITORIAL PERIOD.

[*]William C. C. Claiborne	Acting Governor-General and Intendant of Louisiana	1803–04
Amos Stoddard	First Civil Commandant of Upper Louisiana	1804
William Henry Harrison (Gov. of Ind. Ter.)	Governor " District of Louisiana "	1804–05
James Wilkinson	Governor Territory of Louisiana	1805–07
Joseph Browne	Acting Governor	1807
Frederick Bates	" "	1807
Meriwether Lewis	Governor	1807–09
Frederick Bates	Acting Governor	1809–10
[†]Benjamin Howard	Governor	1810–12
Frederick Bates	Acting Governor " Territory of Missouri "	1812–13
William Clark	Governor	1813–20

STATE.

Alexander McNair	Democrat	1820–24
Frederick Bates	"	1824–25
Abraham J. Williams (act'g)	"	1825
John Miller	"	1825–32
Daniel Dunklin	"	1832–36
Lilburn W. Boggs	"	1836–40
Thomas Reynolds	"	1840–44
M. M. Marmaduke (acting)	"	1844
John C. Edwards	"	1844–48
Austin A. King	"	1848–52
Sterling Price	"	1852–56
Trusten Polk	"	1856–57
Hancock Jackson	"	1857
Robert M. Stewart	"	1857–61
Claiborne F. Jackson	"	1861
Hamilton R. Gamble	Provisional	1861–64
Willard P. Hall (acting)	"	1864–65
Thomas C. Fletcher	Republican	1865–69
Joseph W. McClurg	"	1869–71
B. Gratz Brown	Liberal Republic and Democrat	1871–73
Silas Woodson	Liberal Republic and Democrat	1873–75
Charles H. Hardin	Democrat	1875–77
John S. Phelps	"	1877–81
Thomas T. Crittenden	"	1881–85
John S. Marmaduke	"	1885–87
A. P. Morehouse	"	1887–89
David R. Francis	"	1889–93
William J. Stone	"	1893–97
Lon V. Stephens	"	1897–1901
Alexander M. Dockery	"	1901–05
Joseph W. Folk	"	1905–09
Herbert S. Hadley	Republican	1909–13
Elliott W. Major	Democrat	1913–17
Frederick D. Gardner	"	1917–21
Arthur M. Hyde	Republican	1921–

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MISSOURI, a river in the United States, the largest tributary of the Mississippi. Its headwaters are in southwestern Montana, and the Missouri River proper begins at the confluence of the Jefferson, Madison and Gallatin rivers. The Madison has its source in Yellowstone Park, near the headwaters of Yellowstone River and the geysers in the western part of the park. The Gallatin also has its rise in the same park and not far from the source of the Yellowstone and Madison rivers. The Jefferson rises farther west; its headwaters are near the source of the Snake River. The Missouri from the confluence of the three rivers flows north and east to the Bear Paw Mountains, when it turns and flows south and east a distance of about 50 miles, when again the course changes toward the east, from the 108th meridian to about 107° 30′ northeast, then east to North Dakota, which State it enters at 49° N. It has a very irregular course in the northwestern part of North Dakota, but it is generally southeast to South Dakota, which State it enters at 100° 20′ W. It crosses the State of South Dakota, marking an irregular course, generally in a southeasterly direction to the boundary of Nebraska at 42° 45′ N. From here it forms the boundary between South Dakota and Nebraska to Iowa at 42° 20′, when it turns south and forms the boundary between Nebraska and Iowa, Nebraska and Missouri, and Kansas and Missouri to Kansas City, where it enters the State of Missouri, flows east by north to Brunswick, then east by south, making two large curves, to the Mississippi which it enters 20 miles north of Saint Louis and three miles below Alton, Ill. The length of the whole course from the source of the Madison River is about 2,915 miles, from the source of the Jefferson about 3,000 miles. From its source to the mouth of the Mississippi River is a total length of

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[*] Claiborne was Stoddard's superior.

[†] Governor of Territory of Louisiana, 1810–12; Governor of Territory of Missouri.

4,200 miles, the longest continuous water-way in the world. There are some peculiar irregularities along its course, one in Montana, where the Musselshell River enters, is in the form of a «V,» its opening toward the north, and the sides about 12 miles long. Along the course in each State there are long narrow loops, enclosing lands which are almost islands; across the State of Missouri the river forms three crescents, one pointing north and two pointing south.

The Missouri is noted for the great amount of suspended silt it always carries and which has given it the name «Big Muddy.» This silt is deposited in reefs which change the current, and frequently much damage results. In 1903 considerable damages were sustained by the washing away or grinding away of portions of Decatur, and Covington in Nebraska, Sioux City in Iowa and Yankton in South Dakota. The river follows no known rules as to when or where it will deposit its burden of silt, change its current and begin to destroy a solid shore line. Dikes and stone walls have been constructed in many places. In the upper part of its course the Missouri passes through the «Gate of the Rocky Mountains,» a gorge about six miles long and having perpendicular walls about 1,200 feet in height. At Great Falls, Mont., there are a series of falls making a vertical descent of 350 feet in 16 miles. The highest falls is 87 feet.

The chief tributaries are in Missouri, the Osage and Kansas; in Nebraska, the Platte and Nibrara; a large number of short streams in Iowa; the Big Sioux, White, James and Cheyenne, in South Dakota; the Little Missouri in North Dakota; and the Yellowstone and Milk in Montana. The extent of country drained by the Missouri and its tributaries is about 500,000 square miles or nearly two-fifths of the whole Mississippi Basin. The northern point of the basin of the Missouri extends almost to the Saskatchewan River. The Missouri is a swiftly flowing stream in its upper course, and for a distance of about 500 miles it presents scenes of almost unequaled grandeur. It forces its way through narrow gorges, foams over cataracts and winds around mountains. In the lower part of its course the waters move more slowly on its journeys across the vast plains. It is navigable in summer, during the flood period, to Great Falls, Mont., and in low water as far as Buford at the mouth of the Yellowstone River. The flat-bottomed steamboats are necessarily those used for navigation on the Missouri.

The principal cities on the river from the upper course to its mouth are Great Falls and Fort Benton in Montana; Bismarck, the capital of North Dakota; Pierre, the capital of South Dakota; Sioux City, Iowa; Omaha, Neb.; Atchison, Leavenworth and Kansas City, Kan.; Kansas City, Saint Joseph and Jefferson City, Mo. That portion of Iowa lying near the mouth of the Little Sioux and north for about 70 miles, between the Missouri and the Little Sioux, is below the level of the Missouri from 8 to 32 feet. The area of the tract below water level is about 840 square miles, and embraces some of the finest farms and most prosperous towns of the State.

The history of this river is connected with the history of the early explorers and missionaries and with the lives of the miners and settlers of the latter part of the 19th century. The possibilities in the unused water power of its upper course are enormous. The great prairies through which the river passes on its lower course contain the most productive lands in the United States.

MISSOURI, University of, a higher educational institution established by an act of the general assembly of the State of Missouri, approved 11 Feb. 1839, two days after the approval of the act establishing the public school system of the State. In June of the same year the university was located at Columbia, Boone County, which is near the State's geographical centre. Boone County was selected as the home of the State's highest educational institution because its people offered the most liberal bid of the six central Missouri counties. The cornerstone of the main building was laid 4 July 1840, and in the following spring, April 1841, instruction in academic courses was begun. The first class, consisting of two members, was graduated in 1843. Something of the growth of the university is indicated by the fact that in 1917 it awarded 838 degrees and certificates. Women were admitted to the teacher-training department of the university in 1869. Since that time all other departments have been opened to them on the same terms as to men, and gradually the proportion of women students to men has grown, until in 1917 women numbered about one-third of the total enrolment. The government of the University of Missouri is vested in a board of curators, consisting of nine members appointed by the governor of the State, the terms of three members expiring every two years. The student enrolment in 1922–23 was 6,741. The faculty consisted of 361 members of the rank of instructor or higher. Its foundation was made possible by the enlightened policy of the national government with reference to Territories seeking admission into the Union. In admitting Missouri in 1820, Congress set aside two townships of land — 46,080 acres — for the support and maintenance of «a seminary of learning.» From the income of this national grant, from the gifts of Boone County people and from student fees, the university received its entire support for the first 28 years of its existence. The first State aid was given in 1867, when $10,000 was appropriated by the general assembly for building and repairs. The university is now supported and maintained by appropriations from the State treasury, by Federal appropriations, income from its endowment funds and by the fees and deposits received from students. Tuition is free to residents of Missouri; students from other States pay a tuition fee of $10 a semester.

The national character of the early University of Missouri has been strengthened by the continuing Federal appropriations and the coming each year of students from more than three-fourths of all the States and nearly all the non-contiguous possessions of the United States. In its former student body of 7,000 graduates and about 25,000 non-graduates, every State and nearly every leading nation of the world has representatives. The university has extended its educational scope to include in the curricula of its various schools and colleges theoretical instruction and practical training in all the leading activities of its constituents. Starting in 1841 with only an academic department, it is now composed of the following colleges and schools: College of Arts and Science, College of Agriculture, School of Education, School of Law, School of Medicine, School of Engineering, School of Mines and Metallurgy, School of Journalism, School of Business and Public Administration, Graduate School and the Extension Division.

The School of Mines and Metallurgy is at Rolla, Phelps County, Mo.; the other divisions are at Columbia. In addition to the work of the above schools and colleges, emphasis is given in particular lines of study by the establishment of minor divisions, chief of which are the Agricultural Experiment Station, the Engineering Experiment Station, the Missouri State Military School and the Mining Experiment Station at Rolla. The university also holds a summer session. In all the divisions of the university the laboratory method is followed. The university grounds at Columbia cover more than 800 acres. The main divisions are in the West Campus, the East Campus, the athletic fields and the university farm. A 20-acre tract of timber land near the university is used for experimental work in forestry and a demonstration forest. About five miles south an 80-acre tract is used for experimental work in horticulture. On a 90-acre tract two miles north of the university is a new plant for the manufacture of hog cholera serum. The university also has a forest of 50,000 acres in the Ozark Mountains of southern Missouri. On the grounds at Columbia are about 50 university buildings. The libraries of the university are the general library; law library; medical library; engineering library; agricultural library; collections in the observatory, chemical, geological and zoological buildings; and the library of the School of Mines at Rolla. These libraries contain about 200,000 volumes and pamphlets, and 1,400 publications are received currently in Columbia. The general library is now housed in a separate building, erected in 1915.

Students' expenses average $300 a year for men and $375 for women. Material reductions from these figures may be accomplished by living at the university dormitories and eating at the Commons.

Scholarship at the university is promoted by the offering of a large number of fellowships, scholarships and prizes. These yield from $50 to $400 a year. Each school and college also has its honorary organizations, and there are local branches of several national, scientific and professional societies.

MISSOURI COMPROMISE, in American politics, a term given to a compromise under an act of Congress passed in February 1821, at which time Missouri was admitted into the Union as a slave State, declaring that all territory west of Missouri and north of lat. 36° 30′ should forever be free from slavery. This compromise was virtually repealed in 1854, when territorial governments were established for Kansas and Nebraska. Consult Woodburn on ‹Historical Significance of the Missouri Compromise› (in Annual Report of the American Historical Association, 1893); and Hodder, ‹Side Lights on the Missouri Compromise› (ib. 1909). See KANSAS, *History;* KANSAS-NEBRASKA BILL; MISSOURI.

MISSOURI, or GOURD-SEED, SUCKER, a fish. See BLACKHORSE.

MISSOURI VALLEY, Iowa, city in Harrison County, on the Chicago and Northwestern Railroad, about 120 miles west of Des Moines, the capital of the State, and 20 miles north of Council Bluffs. It is in a fruit growing and stock raising district and has large railroad shops, machine-shop, flour-mills, dairy products, bricks, coffins, grain elevators and stock yards. The fair grounds of the County Agricultural Society are located here. It has a Carnegie public library and the city owns and operates the waterworks. Pop. about 4,000.

MISSOURI VALLEY COLLEGE, in Marshall, Mo., a coeducational institution, founded under the auspices of the Cumberland Presbyterians in 1889. The courses lead to the degrees of A.B. and Ph.B. The faculty comprises 15 instructors and professors and the average attendance of students is over 300. The library and the grounds, buildings and apparatus are valued at $851,385; the productive funds over $200,000, and the annual income about $45,140.

MIST. See FOG.

MISTAKE, a term commonly used as the equivalent of blunder, error, erratum and particularly employed in law of a misconception affecting action. In general the law, by an extension of the rule that ignorance is no excuse, makes a mistake without remedy. This does not apply, however, in any misapprehension which may be brought under the law of contracts or the principle of quasi-contract. So, too, in equity there is a possibility of relief for mistake and its consequences.

MISTASSINI, mĭs-tās-sē'nē, Canada, a lake in Quebec province, about 300 miles north of Quebec, and due east from the southern point of James Bay in Hudson Bay. It consists of two parallel narrow portions separated by a chain of islands, the western and larger portion being about 100 miles long, and a maximum breadth of 20 miles. Area, 975 square miles. It has a depth of between 300 and 400 feet. It drains by Rupert River into James Bay. The waters of Mistassini teem with fish, while its shores are densely wooded. The lake was first visited by French missionaries in 1671, but was not surveyed until 1884. The Hudson's Bay Company maintains a trading-post on the lake.

MISTLE-THRUSH, or STORMCOCK, British names for a large European thrush (*Turdus viscivorous*), whose fine song is heard for a longer season than in the case of most birds, and on rainy days as well as sunny. Its common name is due to its unusual fondness for the berries of the mistletoe. In plumage it resembles the American wood-thrush.

MISTLETOE, a popular name for several related shrubs parasitic upon various deciduous trees, such as apple, thorn, maple, poplar, locust, linden, but rarely oak. The European or common mistletoe (*Viscum album*) of the natural order *Loranthaceæ*, is the one referred to in poetry and prose but a relative named *Phoradendron flavescens* is the species most commonly found at Christmas time in the markets of America. The former, which is common almost throughout Europe, is an evergreen, bifurcately branched shrub, with opposite, almost sessile, oblong, leathery leaves; inconspicuous flowers in small terminal heads or in the angles of the branches, the pistillate and staminate flowers upon separate plants; and whitish, translucent, glutinous berries about a quarter of an inch in diameter. The stickiness serves to attach the berries to the host plant until germination is complete, the sprout, it is said, always turning toward the point of attachment. The American or false mistletoe is similar in habit and appearance, and has fallen heir to some of the traditions and functions of its European cousin, especially the Christmas practice of kissing under a suspended sprig. Anciently the European species was held to be sacred by the Druids and the Germans, and by the Celts was credited with magical properties, references to all of which are frequent in literature. Its formerly reputed value in medicine has also passed away. Several other species are well known, especially the fragrant flowered *Loranthus odoratus*, and *L. europæus;* the latter being distinguished for its racemes of flowers and its frequent appearance upon oak trees. The common American species mentioned above ranges from New Jersey to Indiana and southward to Florida and Texas. Several related species are found on the Pacific coast.

MISTRAL, mēs-träl, **Frédéric,** French poet: b. Maillane, Bouches-du-Rhone, 8 Sept. 1830; d. there, 25 March 1914. He studied law for a time, but abandoned it and gave his attention to writing in Provençal, the dialect of southern France, which, under the influence of Jasmin, the «barber-poet,» had entered on a renaissance as a literary medium. In 1854 he, with six others, founded the well-known Society of the Felibrige; and in 1859 he published his ‘Mirèio,’ a narrative poem in the recovered language, which was crowned by the Académie in 1861. A second work in verse, ‘Calendau,’ came out in 1867; a volume of poems, ‘Lis Isclo d'Or’ (The Isles of Gold), in 1875; ‘Lou Trésor dou Félibrige,’ a dictionary of modern Provençal, in 1878–86; and the historical poem ‘Nerto,’ in 1884. ‘La Rèino Jano’ (1890) is a tragedy, and ‘Le Poème du Rhône’ (1879), another narrative poem. There are English renderings of ‘Mirèio’ by Grant (1867), Crichton (1868) and Preston (1872). In 1904 he was awarded, jointly with José Eshegaray, the Nobel prize in literature. Consult Downer, ‘Frédéric Mistral’ (1901).

MISTRAL, the local or provincial name of a strong northwest wind, which, blowing from the Alps, forms one of the scourges of Provence and the valley of the Rhône. It is caused by low atmospheric pressure in the Gulf of Lyons with high pressure in the north, and corresponds with the «bora» of southern Russia. It blows with great violence during the winter and spring months. Its approach is indicated by a sudden change in the temperature from warmth to cold; the air becomes purer and more invigorating, light fleecy clouds are seen in the sky and at night the stars shine with extraordinary brightness. The tempest it causes in the Mediterranean from Ebro to the Gulf of Genoa is very dangerous to small vessels.

MISTRETTA, mē-strĕt'ta, Sicily, town in the province of Messina, 34 miles northeast of Caltanissetta, 50 miles northwest of Catania and about 11 miles from the sea. It is in the most fertile region of Sicily and is 3,200 feet above sea-level. Lignite is mined in the vicinity. The chief industries are farming and cattle-raising. An annual fair is held here. The name was anciently Aniestratus. Pop. 18,000.

MISTRIAL, a trial which is erroneous on account of some defect in the persons trying, as if the jury come from the wrong county, or because there was no issue formed, as if no plea be entered, or some other defect of jurisdiction. Where a jury is discharged without a verdict, the proceeding is properly known as a mistrial. Consent of parties cannot help such a trial, when past. It is error to go to trial without a plea or issue, in the absence of counsel and without his consent, although an affidavit of defense be filed in the case, containing the substance of a plea, and the court has ordered the case on the calendar for trial. On an indictment for perjury, an infant under the age of 21 years, and not otherwise qualified, not having, in fact, been summoned, personated his father as a juror. Here was a mistrial, because the verdict in the case was the verdict of but 11 jurors. A mistrial leaves the parties to an action *in statu quo ante,* and in criminal cases the indicted person may be retired as at a mistrial such a person is not considered to have been placed in jeopardy. See TRIAL.

MISU, Nicholas, Rumanian diplomat, represented his country (with M. Bratiano) at the Peace Conference in Paris. By origin a Macedonian Rumane, M. Misu adopted Rumanian citizenship and served for many years in Balkan capitals. In London he carried on the negotiations with the British government relating to Rumania's entry into the war. He was called home when the conclusion of peace with Germany became inevitable to negotiate terms with the conquerors. He possesses a remarkable knowledge of European and Balkan languages.

MITANNIANS, a race dwelling in Mesopotamia in the 2d millenium B.C. and that came to light by the discovery of some cuneiform tablets found in the rock tombs of Tell-el-Amarna in Upper Egypt (between Memphis and Thebes) in 1887–88. These clay tablets contained Egyptian correspondence with Babylonia, Assyria and other ancient nations. In these tablets, through the scholarship of learned Orientalists, it was discovered that there was a kingdom of Mitanni in northern Mesopotamia which had important relations with Egypt. Moreover, this country was identified as Aram-Naharayim (Aram of the Two Rivers), called in Syriac, Beth-Nahrin, i.e., «the land of the rivers»—Euphrates and Tigris —and meaning particularly the northern portion of Mesopotamia. Aram-Naharayim, in other words Mitanni, was the home of Balaam and probably his famous animal, for in Deut. xxiii, 4 Balaam is called a native of Aram-Naharayim and Numbers xxiii, 7 reads that

Balaam was brought «from Aram out of the mountains of the east.»

The Mitannian kings whose names have been discovered seem to have belonged to the Hittites or Harri, whose capital was at Boghaz Keui, North Cappadocia, explored in 1907. One of these kings, Dushratta whose letters were discovered in the Tell-el-Amarna tablets, was the father-in-law of Amenhotep III of Egypt (1411–1389 B.C.). He was also a contemporary of Subbiluliuma, the Hittite monarch, who seems to have obtained lasting dominion in Syria by subduing Dushratta. Three kings of the same dynasty, Saushshatar, Artatama I and Sutarna I, preceded Dushratta and Ortatama II Artashshumara, Mattuaza and Sultarna II followed him. Some authorities think that this dynasty took possession of the native Mitannians; other authorities find grounds for believing the Mitannians to have been the Hittites, who in 1932 B.C. put an end to the Amoritish dynasty in Babylon and established themselves in Mesopotamia thereafter. Hittite hieroglyphics and cuneiform script were both used among the Mitannians. The gods of this race were the same as in the Babylonian and Assyrian pantheons.

«The discovery of the Tell-el-Amarna tablets revealed to us,» writes Dr. A. H. Sayce, «the existence of a new language, once spoken in northern Mesopotamia in the kingdom of Mitanni, the Aram-Naharayim of the Old Testament. One of the letters addressed to Dushratta, king of Mitanni, to the Egyptian Pharaohs is in the native language of his country and its length is such that a comparison of it with those of his letters which are written in Assyrian makes a partial decipherment of it possible. Shortly after the publication of the cuneiform text by Winckler and Abel in 'Mittheilungen aus den orientalischen Sammlungen' (I No. 27) attempts at the decipherment of the language by Professor Brünnow, Professor Jensen and myself appeared simultaneously in the *Zeitschrift für Assyriologie* (Vol. II and III, 1890.) The cuneiform text has recently been subjected to a very careful re-examination by Dr. Knudtzon and the result of his labors is given in the *Beiträge zur semitischen Sprachwissenschaft* (IV, pp. 134–153). In one of the letters of Dushratta one of his envoys is called Tunip-ipri» (Tell-el-Amarna Tablets in the British Museum, 9, 47) «the king of Tunip. This raises a presumption that the power of Mitanni extended as far as Tunip, the modern Tennip, and that the Mitannian language was spoken there. The presumption is confirmed by a letter sent to the Pharaoh by the people of Tunip in which the native words added to the Assyrian translation, where the latter did not seem quite clear or literal enough, all belong to the language of Mitanni. In the Mitannian letter of Dushratta itself the meaning of a few words and forms is cleared up by the ideographs attached to them.

«It is clear that Mitannian is in its general structure a Caucasian language. It resembles Georgian in its habit of piling suffix upon suffix, pronoun upon pronoun, until the verbal forms become almost impossible to analyze. Like Georgian, also, it occupies a middle position between inflection and agglutination. In this respect it resembles the ancient languages of Asia Minor, so far as we know them, though it is to be noticed that it illustrates the fact that, as we pass eastward, agglutination is more prominent, while westward, as in the case of Lycian, inflection is more pronounced.» See HITTITES. Consult Tell-el-Amarna Tablets in the British Museum (1892); Davies, 'Rock Tombs of Ell-Amarna' (1903); Bezold, C., 'Oriental Diplomacy: the transliterated text of the Cuneiform Despatches discovered at Tell-el-Amarna' (1893); 'The Tell-el-Amarna Letters,' English translation by M. Winckler (Berlin 1896); Knudtzon, J. A., 'Die El-Amarna Tafeln' (Leipzig 1907–09); Petrie, W. M. F., 'Syria and Egypt from the Tell-el-Amarna Letters' (1898); Bork, Ferdnand, 'Die Mitannis sprache' (Berlin 1909); Winckler, 'Vorderasien im zweiten Jahrtausend' (Leipzig 1913), and Sayce, A. H., 'The Language of Mitanni' in Proceedings of The Society of Biblical Archæology (June 1900).

MITAU, mē'tou (Russian Mitava), Latvia, town and capital of the government of Courland, on the right bank of the river Aa, 26 miles southwest of Riga, on the Riga-Orel Railroad. The town is supposed to have received its name from the German *Mitte in der Aue* and is said to have been founded in 1266 by Conrad Mandern, grand-master of the Order of the Brethren of the Sword. When the Lithuanians plundered it in 1345, it had become an important town. In 1561 the Duke of Courland made it his residence and the palace became the seat of government. This castle, which was situated on an island in the river, was destroyed by Duke Biren, who erected in its place (1738–72), a fine palace, now the official residence. Mitau was captured three times by the Swedes in the 17th century and in 1795, when Russia annexed Courland, Mitau was included. The Duke of Provence (afterward Louis XVIII) made Mitau his home in 1798–1801 and again in 1804–07. Napoleon I captured it in 1812. Mitau is only 12 feet above sea-level and at high water the town is sometimes inundated. A canal surrounds the town in the place of the old fortifications. The streets are broad and regular and many contain handsome residences of the German nobility. Mitau possesses a museum with a library, a gymnasium and a theatre and is the home of the Lettish Literary Society. The chief manufactures are chocolate, oilcloth, ink, flour, iron products and hats; and the town also possesses saw-mills, tanneries and iron-works. The trade is large in grain, cattle and wood. Germans outnumber the rest of the races, which include Poles, Letts, Russians and Jews. Most of the inhabitants are Protestant and a general superintendent of the Lutheran Church has his seat there. Pop. 39,200.

MITCHAM, England, a suburb of London, on the river Wandle in Surrey, four miles northwest of Croydon on the London, Brighton and South Coast Railway. It is 10 miles south of London Bridge. The neighborhood abounds in market-gardens and plantations of roses, lavender, peppermint and other herbs for the manufacture of perfumes and essences. Mitcham Common, covering 480 acres, has one of the best golf courses near London. Pop. 30,000.

MITCHEL, mĭch'ĕl, **John,** Irish patriot: b. Dungiven, County Derry, 3 Nov. 1815; d. Drumalane, 20 March 1875. He was graduated from Trinity College, Dublin, in 1836, and practised several years as an attorney at Banbridge. Soon after the starting of the *Nation* in 1842, Mitchell began to contribute to that journal and after the death of Thomas Davis, in 1845, became assistant editor. In 1848 he began the publication of the *United Irishman,* for his articles in which he was sentenced to 14 years' transportation for felony. He was sent to Bermuda, and next to Tasmania, whence he made his escape to the United States in the summer of 1853. Here he published a series of short-lived newspapers, the *Citizen* (at New York), the *Southern Citizen* (Knoxville, Tenn.), the *Inquirer* (Richmond, Va.) and the *Irish Citizen* (New York). An advocate of slavery, he favored the Confederates in the Civil War, on which side his three sons fought, and he was at one time under arrest by the Federal authorities. In 1874 he returned to Ireland. He was elected to Parliament from Tipperary, was declared ineligible, but was re-elected. Among his writings are ‹Life of Hugh O'Neille› (1845); ‹Jail Journal; or Five Years in British Prisons› (1854), and a ‹History of Ireland from the Treaty of Limerick› (1868). Consult Dillon, W., ‹John Mitchel› (London 1888).

MITCHEL, John Purroy, American public official: b. Fordham, N. Y., 19 July 1879; d. near Lake Charles, La., 6 July 1918. His grandfather was the Irish patriot, John Mitchel, who with his three sons fought in the Confederate army during the Civil War. John Purroy was educated at Fordham College (now Fordham University) and in 1899 was graduated at Columbia University. Two years later he was graduated at the New York Law School and was admitted to the bar the same year. One of his early cases involved a mining claim in South America. His work there in an unhealthy tropical region resulted in a fever and peculiar headaches, one of which is thought to have been responsible for the accident which resulted in his death several years later. His entrance into public life was his appointment by Mayor George B. McClellan as special counsel to the city of New York in December 1906. In April of the following year he was made commissioner of accounts and in this capacity he investigated the office of the borough president of Manhattan, John F. Ahearn. The latter was removed and many grafters were made to feel the heavy arm of the law. All advocates of good government in New York were pleased with the ability and integrity of Mitchel and in 1909 he was elected president of the board of aldermen on a fusion ticket, William J. Gaynor being elected mayor at the same time. In August-September 1910 Mitchel was acting mayor while Mayor Gaynor was recovering from a wound inflicted by a maniac. On 7 June 1913 President Wilson appointed Mr. Mitchel collector of the port of New York and in the autumn of the same year he became the fusion candidate for the mayoralty in opposition to C. S. Whitman, then district attorney of New York County. Mitchel won the nomination and after a bitter campaign defeated Judge Edward E. McCall, the regular Democratic nominee, at the November election of 1913. Mitchel's administration passed its first year in comparative peace, municipal markets were established, but on a wholly inadequate scale. Storms came in 1915, 1916 and 1917. On the whole the city administration did much to relieve the increasing number of the unemployed. Sections of the city press began to attack the administration for its failure to curtail expenditures, for its attempt to place the city public schools on an undemocratic basis, and above all for its supineness in dealing with certain railroad corporations who were seeking valuable franchise privileges. Other disclosures in regard to the Rockaway land deals and the Brooklyn terminal project further alienated popular support. Mitchel also angered a great and powerful section of his fellow-citizens through the alleged biased and unfair investigation of Catholic charitable institutions sponsored by him, and in which city officials resorted to the illegal method of wiretapping in an unsuccessful effort to involve certain Catholic clergymen and prominent laymen. As a result, at the close of his administration Mitchel found himself strongly supported by all corporation and big moneyed interests in the city, and heartily despised among the masses of the city's toilers. In 1917 he was again a candidate for mayor. By lavish expenditures of money at the primaries his friends endeavored to secure him the nomination but he was defeated by Bennett. Over 21 persons were indicted for fraud in connection with Mitchel's primary campaign. After defeat at the primaries he stood for re-election as an independent candidate, but at the November election he received 149,260 votes, while the Socialist Hillquit received 141,739, and Hylan, the regular Democratic candidate, received a grand total of 298,149 votes, the greatest plurality in New York's history and an emphatic repudiation of Mitchel's administration. On 11 Jan. 1918 Mr. Mitchel was commissioned major in the Aviation Corps of the United States army. He received his cadet training at San Diego, Cal., and soon became noted for his daring in the air. He was transferred to Gerstner Field, near Lake Charles, La., to receive the finishing stages of training necessary for service at the war front. On the morning of 6 July Mr. Mitchel fell from a single-seater scout plane at a height of about 500 feet and was killed. A few days later a public funeral was held from Saint Patrick's Cathedral.

MITCHEL, Ormsby McKnight, American astronomer: b. Morgansfield, Ky., 10 July 1810; d. Hilton Head, S. C., 30 Oct. 1862. He was graduated from West Point in 1829, and was made assistant professor of mathematics there, which post he held for two years. From 1832 to 1834 he was counsellor-at-law in Cincinnati, Ohio; from 1834 to 1844 professor of mathematics, philosophy and astronomy at Cincinnati College; and 1836–37 chief engineer of the Little Miami Railroad. He lectured in various parts of the United States on astronomy in 1842–48, raised funds for the building of an observatory at Cincinnati, the cornerstone of which was laid 9 Nov. 1843, and was its director in 1845–59. In 1859 he became director of the Dudley Observatory at Albany, N. Y. He was known as a popular lecturer on astronomy, and scarcely less distinguished for his mechanical skill. He perfected a variety of apparatus of great use to astronomy. One of the most important of his constructions was an apparatus for recording right ascensions and declinations to within $\frac{1}{1000}$ of a second. He also invented an instrument for the measurement with great accuracy of large differences of declination, such as the ordinary method by micrometer was unable to reach. In 1861 he entered the Federal army as brigadier-general of Ohio volunteers, and on 11 April 1862 was promoted major-general. From 17 September he commanded the Department of the South and the Tenth corps, operating in South Carolina. He was known in the army as «Old Stars.» He was a Fellow of the American Academy of Arts and Sciences and an associate of the Royal Astronomical Society of London. He published and edited *The Sidereal Messenger* (1848–58), and wrote ‹The Planetary and Stellar Worlds› (1848); ‹The Orbs of Heaven› (1851); ‹Popular Astronomy›; ‹A Concise Elementary Treatise of the Sun, Planets, Satellites and Comets› (1860), both republished (London 1892), and ‹The Astronomy of the Bible› (1863). Consult Mitchel, F. A., ‹Life of Ormsby McKnight Mitchel› (Boston 1887).

MITCHELL, mĭch'ĕl, **Anthony,** Scottish bishop: b. Aberdeen, Scotland, 24 Oct. 1868; d. there, 17 Jan. 1917. He was educated at Aberdeen University, where he won prizes for his ability in classic studies, and at Edinburgh University and the Episcopal Theological College, and was ordained in 1892. After serving as rector of Saint Mark's Church, Portobello, he became principal and Pantonian professor of theology at the Theological College of the Episcopal Church in Scotland in 1905. He was appointed canon of Saint Mary's Cathedral in 1905, and chancellor in 1912. He was well known in the United States, having come here in 1914 to deliver lectures on theology and on the history of Scotland. His published works are ‹Tatters from a Student's Gown› (1890); ‹History of the Episcopal Church in Scotland› (1907); ‹Story of the Church in Scotland› (1908); ‹Biographical Studies in Scottish Church History› (1914).

MITCHELL, Charles, English pugilist: b. Birmingham, 1861; d. Hove, near Brighton, April 1918. He first took to fencing, of which science he became a teacher before he was 20. Adding boxing to his repertory, he had passed through several successful bouts with amateurs until he distinguished himself in 1882 by winning a competition open to all English heavyweights. Although he was little more than a lightweight himself, he had already won a similar competition for middleweights. He was then brought to America to meet John L. Sullivan, who then weighed 204 pounds against Mitchell's 150 pounds. In the second round at Madison Square Garden the Englishman knocked his opponent off his feet, and at the close of the third round the fight was stopped by the police. Mitchell's two-handed blows were so accurate and severe that for a long time Sullivan declined his challenge to a contest under Prize Ring rules in a 24-foot arena. On 10 March 1888, however, they met at Chantilly in France, and after a struggle of 39 rounds, lasting 3 hours, 10 minutes, 55 seconds, the fight was declared a draw. Fought in the open air, in a pouring rain, that battle formed one of the strangest chapters in the annals of old-style pugilism. The rounds varied in duration from 7 minutes, 7 seconds to 10 seconds, Mitchell often going down at the slightest tap to economize his strength. In the earlier stages, Sullivan, with 42 pounds advantage in weight, had much the best of the fighting, but he could never really corner his elusive opponent, who seemed little the worse for the punishment he had received when the draw was mutually agreed to. Mitchell practically retired from the ring after the fight, but returned in 1894, past his prime and out of form, only to be knocked out in the third round by J. J. Corbett after an exciting contest. Mitchell had never been knocked out before. He was married to a daughter of George Washington Moore, popularly known as «Pony» Moore, formerly a circus rider and one of the founders of the Moore and Burgess Minstrels. In temperament Mitchell, though a most brilliant and courageous boxer, was extremely sensitive and quick to take offense.

MITCHELL, Clifford, American physician: b. Nantucket, Mass., 28 Jan. 1854. He was graduated at Harvard in 1875; studied medicine in the Chicago Medical College and the Chicago Homœopathic Medical College; began to practise in Chicago in 1878; and devoted himself to diseases of the kidneys. He was for many years professor of chemistry, toxicology, and renal diseases at the Chicago Homœopathic Medical College, and after 1905 of clinical urinology and renal diseases at Hahnemann Medical College, Chicago. He is associate editor of the *Clinique* and of the Phi Alpha Gamma *Quarterly*. Has established a diagnostic laboratory in the Marshall Field Annex, and invented a stain for urine sediments and a rapid test for albumin in urine. He is author of ‹Student's Manual of Urinary Analysis› (1879); ‹Physician's Chemistry› (1884); ‹Dentist's Manual of Special Chemistry› (1887); ‹Renal Therapeutics› (1898); ‹Diseases of the Urinary Organs› (1903); ‹Modern Urinology› (1912).

MITCHELL, Donald Grant, American author («Ik Marvel»): b. Norwich, Conn., 12 April 1822; d. Edgewood, Conn., 15 Dec. 1908. He was graduated at Yale in 1841; studied law in New York; was United States consul to Venice in 1853; and in 1855 settled on his farm, «Edgewood,» near New Haven. He has written much, on various themes, and always with a genial charm and ease of style. His best-known works are the idyllic sketches called ‹Reveries of a Bachelor› (1850), and ‹Dream Life› (1851). He also wrote ‹French Gleanings› (1847), descriptive of his first European trip, as ‹The Battle Summer› (1850) was of his stay in Paris in 1848; ‹The Lorgnette› (1850), a satiric novel of New York life in the forties; ‹Fudge Doings› (1855), another New York society novel; ‹The Seven Stories with Basement and Attic,› a series of tales of travel (1864); ‹Dr. John› (1866), a religious story contrasting life in Connecticut and in the French Midi; and the more characteristic papers on men, books and outdoors, such as ‹My Farm at Edgewood› (1863); ‹Wet Days at Edgewood› (1865); ‹Rural Studies› (1867);

'English Lands, Letters and Kings' (1889), and 'American Lands and Letters' (1897).

MITCHELL, Edward Page, American journalist: b. Bath, Me., 24 March 1852. He was graduated at Bowdoin College in 1871 and joined the staff of the Boston *Advertiser.* Since 1875 he has been engaged on the editorial staff of the New York *Sun,* of which he became editor in 1911. In 1913 he was special lecturer at the Columbia School of Journalism. In 1909–11 he was president and after that date vice-president of the Sun Printing and Publishing Company. Mr. Mitchell's writings on the editorial page of the *Sun* have attracted wide attention for their brilliancy. He has also contributed to magazines. He is an overseer of Bowdoin College and a member of numerous clubs.

MITCHELL, Elisha, American scientist: b. Washington, Conn., 19 Aug. 1793; d. on Mount Mitchell, N. C., 27 June 1857. He was graduated at Yale in 1813; four years later became professor of mathematics in the University of North Carolina; and in 1826 was made professor of chemistry, mineralogy and geology in the same institution. The Olmsted-Mitchell Geological Survey (1824–28) did important work under his supervision. He discovered that a peak in North Carolina is the highest in the Eastern States and during a storm he was killed by a fall from this height. It is now called in his honor Mount Mitchell or Mitchell's High Peak, and on its summit he is buried.

MITCHELL, Henry, American civil engineer: b. Nantucket, Mass., 16 Sept. 1830; d. Boston, Mass. 11 Dec. 1902. He was a son of William Mitchell (q.v.), was educated at the Normal School in Bridgewater, Mass., and in 1851 was appointed to government service as a civil engineer under the United States Coast Survey. He acted as assistant to the commissioners on harbor encroachments in New York in 1859 and discovered the underflow of the Hudson. He was later engaged in Boston harbor and assisted in the improvement of the mouth of the Mississippi in 1874. He made an investigation of the Panama Canal scheme under De Lesseps and held many government commissions to investigate the principal harbors along the Atlantic Coast, including Portland, Me., Providence, R. I., Norfolk and Portsmouth, Va., and Philadelphia, Pa. He was appointed professor of physical hydrology at the Massachusetts Institute of Technology in 1869. In 1874 he was the representative of the United States Coast Survey on the board of engineers for the improvement of the mouth of the Mississippi, and later a member of the James B. Eads advisory board and of the Mississippi River Commission. In 1879 he visited the Suez Canal and inspected it under the authority of Ferdinand De Lesseps. He published many reports of surveys, etc.

MITCHELL, Hinckley Gilbert, American biblical scholar: b. Lee, Oneida County, N. Y., 22 Feb. 1846. He was graduated at Wesleyan University in 1873 and in the theological department of Boston University 1876, and Leipzig University 1879. From 1879 to 1880 he was pastor of the Methodist Episcopal Church at Fayette, N. Y. In 1880–83 he was instructor in Hebrew and Latin in Wesleyan University, and in 1883–1905 professor of Hebrew and biblical exegesis in Boston University; 1905–06 instructor in the Semitic languages in the same institution. Since 1910 he has been professor of Hebrew and Old Testament exegesis in Tufts College. In 1901–02 he served as director of the American School of Biblical Research in Jerusalem; in 1914 for the summer quarter he was supplying professor in the University of Chicago and lecturer at two sessions of the Summer School of Theology, Harvard University. His most important publications are 'Hebrew Lessons' (1884); 'Amos' (1893); 'The Theology of the Old Testament,' a translation from Piepenbring (1893); 'Isaiah, chapters i–xii' (1900); 'The World before Abraham' (1901); 'Tales Told in Palestine,' in collaboration with J. E. Hanauer (1904); 'Genesis' (1909); 'Haggai and Zechariah' (in the International Commentary 1912); 'The Ethics of the Old Testament' (1912), and numerous articles in *The Journal of Biblical Literature* and various theological publications.

MITCHELL, John, American labor leader: b. Braidwood, Will County, Ill., 4 Feb. 1870; d. New York, 9 Sept. 1919. He entered the mines at Braidwood at the age of 13, and in 1885 joined the Knights of Labor. The next few years he spent in the West and Southwest, and in 1890 settled at Spring Valley, continuing his work at his trade. He read and studied constantly and was a member of several debating societies and reform clubs; he was also active in the labor movement and was president of the Knights of Labor local at Spring Valley. On the formation of the United Mine Workers in 1890 he became a member of that organization, was frequently delegate to district conventions and in 1895 was elected secretary-treasurer of the northern Illinois subdistrict; in 1896 he was chairman of the Illinois mine workers' legislative committee, and in 1897 was made a national organizer of the United Mine Workers. In January 1898 he was elected vice-president of that organization and in September of the same year became acting president; he was elected president in 1899, but retired in March 1908; he was also a vice-president of the American Federation of Labor from 1898 to 1914. During his term of office as president of the United Mine Workers the union was enlarged, wages were increased and the eight-hour day extended; he conducted the strikes of the anthracite miners in 1900 and 1902, and brought the latter to a close by his offer in behalf of the miners to accept the decisions of a commission appointed by the President of the United States. After serving for nearly three years as active head of the Trade Agreement Department of the National Civic Federation, he spent two years on the lecture platform, speaking in all parts of the country. He served on the New York State Commission on Employers' Liability and Workmen's Compensation, which drafted the first compensation law enacted by the State of New York. In March 1914 he was appointed to membership on the Workmen's Compensation Commission of New York State, then created, and when in May 1915 this commission was merged with the State Department of Labor, under the administration of the Industrial Commission, he was made chairman of the Industrial Commission of the State of New York.

MITCHELL, John Ames, American editor and author: b. New York, 17 Jan. 1845; d. 29 June 1918. He was educated at Harvard and studied in Boston and Paris, and was an architect in Boston in 1870–76, after which he became interested in decorative art and studied art in Paris, 1876–80. Returning to New York he engaged in journalism as artist, illustrator and writer, and in 1883 founded and edited *Life,* one of the very best periodicals of its kind in the United States. He was a member of the National Institute of Arts and Letters. He published 'Croquis de l'Exposition' (1879); 'The Romance of the Moon' (1886); 'The Last American' (1889); 'Amos Judd' (1895); 'The Pines of Lory' (1901); 'The Villa Claudia' (1904); 'The Silent War' (1906); 'Pandora's Box' (1911).

MITCHELL, John H., American lawyer and senator: b. Washington County, Pa., 22 June 1835; d. Portland, Ore., 8 Dec. 1905. He was educated at Witherspoon Institute, Pa., and was admitted to the bar of Pennsylvania and went to California, where he established a law practice, but in 1860 removed to Oregon and engaged in practice there. He was State senator in 1862–66 and president of the senate in 1864. In 1867–71 he was professor at Willamette University, Salem, Ore. In 1873–79 and 1885–97 he was United States senator from Oregon and was returned to the Senate in 1901. He acquired a considerable fortune as lawyer to the great Western railroads.

MITCHELL, John Kearsley, American physician: b. Shepherdstown, Va., 12 May 1798; d. Philadelphia, Pa., 4 April 1858. Returning from Ayr and Edinburgh, Scotland, where he had been sent at the age of eight, he studied medicine under Dr. Nathaniel Chapman and was graduated at the medical department of the University of Pennsylvania in 1819. He made three voyages to China and the East Indies as ship-surgeon and then settled in Philadelphia as general practitioner. In 1824 he lectured on the institutes of medicine and physiology at the Philadelphia Medical Institute, and in 1826 became professor of chemistry there. He was given the chair of chemistry at the Franklin Institute in 1833 and for five years delivered annual courses of lectures on chemistry as applied to medicine and the arts. From 1841 to 1858 he was professor of the theory and practice of medicine at Jefferson Medical College. Dr. Mitchell was visiting physician to the Pennsylvania and City hospitals. In addition to numerous papers published in medical and scientific journals, he wrote 'Saint Helena, a poem by a Yankee' (1821); 'Indecision, a Tale of the Far West and Other Poems' (1839); 'On the Wisdom, Goodness and Power of God as illustrated in the Properties of Water' (1834); and 'On the Cryptogamous Origin of Malarious and Epidemic Fevers' (1849), a theoretical anticipation of modern views. His 'Five Essays on Various Chemical and Medical Subjects' were published after his death by his son, Silas Weir Mitchell (1858).

MITCHELL, Langdon Elwyn (pen-name «JOHN PHILIP VARLEY»), American author and playwright: b. Philadelphia, Pa., 17 Feb. 1862, son of Dr. Silas Weir Mitchell (1829–1914). He was educated at Saint Paul's School, Concord, N. H., and in Europe. He studied law at Harvard and Columbia, and in 1886 he was admitted to the New York bar. From 1883 he devoted himself to literature and the drama. He is a member of the National Institute of Arts and Letters and of the Players Club, New York. His most successful plays are 'Becky Sharp' and 'The New York Idea.' His books are 'Sylvian and Other Poems' (1884); 'Poems' (1894); and 'Love in the Backwoods' (1896).

MITCHELL, Maggie. See MITCHELL, MARGARET JULIA.

MITCHELL, Margaret Julia («MAGGIE MITCHELL»), American actress: b. New York, 1832; d. 22 March 1918. She made her first appearance on the stage as an infant and before she was five had taken child parts. She made her début as Julia in 'The Soldier's Daughter' at Burton's Chambers Street Theatre in New York, and as Fanchon, the Cricket, produced in 1860, she made herself famous. She was married to Henry Paddock, her manager, 15 Oct. 1868, and continued her career on the stage, playing in many famous rôles: 'The Pearl of Savoy'; 'Jane Eyre'; 'Little Barefoot'; 'Mignon,' etc. She divorced Mr. Paddock in 1888 and married Charles Abbott, her leading man, in August 1889. Her last public appearance took place in April 1892.

MITCHELL, Maria, American astronomer: b. Nantucket, Mass., 1 Aug. 1818; d. Lynn, Mass., 28 June 1889. She was the daughter of William Mitchell (q.v.), an astronomer of some note, and when a girl frequently assisted him in his observations. She taught for a time in a private school, and was for 20 years librarian of the Nantucket Athenæum, but continued to carry on her astronomical studies and observations. She first became known as an astronomer by her discovery of a comet in 1847, and for this discovery she received a medal from the king of Denmark. She later discovered several nebulæ and was engaged in computations for the 'Nautical Almanac' and on work for the Coast Survey for several years. In 1848 she was elected an honorary member of the American Academy of Arts and Sciences, the first woman to receive this honor, and in 1857 went to Europe, visited the principal observatories and was received with honor by Herschel, Humboldt and other noted scientists. In 1865 she was appointed professor of astronomy and director of the observatory at Vassar College. She went to Burlington, Iowa, with some of her students to observe the total eclipse of the sun in 1869 and on other eclipse expeditions; but for the most part she gave up her research and observation work to devote herself to teaching and building up her department. She was an inspiring and original teacher and deeply interested in the advancement of the interests of the college; during her later years there she endeavored to raise a fund to endow the chair of astronomy; this fund ($50,000) was completed after her death and was named in her honor the Maria Mitchell Endowment Fund. She resigned from her position at Vassar in 1888 and was made professor emeritus. She was a member of the American Association for the Advancement of Science and was given the degree of LL.D by Hanover in 1852 and by Columbia in 1887. She was a believer in woman's suffrage, but not active in the suffragist movement; she was, however, a member and for several years president of the American Association for the Advancement of Women. In 1908 the Maria Mitchell Observatory was dedicated at Nantucket. The Maria Mitchell Astronomical Society was named in her honor. Consult Babbitt, M. K., 'Maria Mitchell as Her Students Knew Her' (Poughkeepsie 1912); Kendall, P. M., 'Life, Letters, and Journals of Maria Mitchell' (Boston 1896); Mitchell, Henry, in 'Proceedings of the American Academy of Arts and Sciences' (Vol. XXV, Boston 1889–90); Whitney, M. W., 'In Memoriam' (Poughkeepsie 1889).

MITCHELL, Peter, Canadian statesman: b. Newcastle, New Brunswick, 4 Jan. 1824; d. Montreal, 25 Oct. 1899. He studied law and was admitted to the bar in 1848. Shipbuilding and other business pursuits soon engrossed his attention and he abandoned law, but in 1856 he entered political life as Liberal member in the provincial assembly of New Brunswick, and in 1860 was appointed to the legislative council, and five years later was appointed a life member of the legislative council and was premier 1865 to 1867. Mitchell was one of the foremost in the organization of the Canadian confederation, and was a delegate to the Charlottetown and Quebec conferences, and to London in 1866. He was appointed to the Canadian Senate in 1867, and resigned in 1873. He was Minister of Marine and Fisheries, 1867–74, and was chiefly instrumental in settling the negotiations between the United States and Canada over the Bering Sea fisheries. He sat in the House of Commons, 1874–78 and 1882–96. He purchased in 1885, and for some years edited, the Montreal *Herald*. In 1897 he was appointed inspector of fisheries for the Atlantic provinces. He was the author of a review of President Grant's message to Congress relative to the Canadian fisheries (1870).

MITCHELL, Samuel Alfred, American astronomer: b. Kingston, Ontario, Canada, 29 April 1874. He was graduated at Queen's University, Kingston, in 1894 and took his Ph.D. in Johns Hopkins in 1897, where he had been Fellow in astronomy in 1896. He was tutor and instructor in astronomy at Columbia in 1899–1908 and became professor of astronomy at the McCormick Observatory, University of Virginia, in 1913, which post he now (1918) holds. He was a member of the United States eclipse expeditions to Georgia (1900), to Sumatra (1901), to Spain (1905) and to Oregon (1918). In the summers of 1907, 1909, 1910 and 1911 he was research associate at Yerkes Observatory, University of Chicago. In 1909–12 he was editor of the *Monthly Evening Sky Map*. He is a member of various scientific societies.

MITCHELL, Samuel Augustus, American geographer: b. Bristol, Conn., 30 March 1792; d. Philadelphia, 20 Dec. 1868. His early life was devoted to teaching in which he was very successful, but the inadequate treatment of geography by the textbooks then in use induced him to turn his attention to the making of satisfactory ones and he spent 40 years in Philadelphia in the preparation of textbooks on that subject. So general was their adoption that they reached a total sale of 400,000 annually. Besides his geographical textbooks, of which there were 24, he edited a new edition of John James Audubon's 'Birds of America' and wrote 'General View of the World, Physical, Political, and Statistical' (1846), and 'New Traveller's Guide through the United States' (1850).

MITCHELL, Silas Weir, American physician, inventor of the "rest cure," poet and novelist: b. Philadelphia, 15 Feb. 1829; d. 4 Jan. 1914. He studied at the University of Pennsylvania, was graduated from Jefferson Medical College in 1850, entered practice in Philadelphia, during the Civil War was in charge of the Turner's Lane United States hospital (Philadelphia) for diseases and injuries of the nervous system, and subsequently was president of the Philadelphia College of Physicians. In his professional capacity he became known for his researches in connection with nervous diseases, and in physiology and toxicology. A bibliography of his publications would supply the titles of some 150 medical papers, recounting investigations of high scientific importance. To a wider degree, however, he is known through his literary work, composed principally of poetry and fiction. He was elected to the American Academy of Arts and Sciences and the National Academy of Sciences, and was also made associate corresponding or honorary member of foreign scientific societies. His works in medical science include 'Researches on the Venom of the Rattlesnake' (1860); 'Gunshot Wounds and other Injuries of Nerves'; 'Reflex Paralysis' (1864); 'On Injuries of the Nerves and their Consequences' (1872); and 'Fat and Blood, and How to Make Them' (1877). Among his other writings are, in verse, 'The Hill of Stones' (1882); 'The Masque' (1887); 'The Psalm of Death' (1890), and 'The Wager' (1900); in fiction, 'Roland Blake' (1884); 'Far in the Forest' (1888); 'A Madeira Party' (1895); Hugh Wynne' (1897); 'The Adventures of François' (1899); 'The Autobiography of a Quack' (1900); 'Circumstance' (1901); 'Collected Poems' (1896); 'Memoir of Owen Jones' (1896); 'Constance Trescot' (1905); 'Doctor and Patient.' Consult Oberholtzer, E. P., 'Personal Memories of Weir Mitchell' (in the *Bookman*, Vol. XXXIX, New York 1914); the *Book News Monthly* (Vol. XXVI, Philadelphia 1907); Tucker, B. R., 'S. Weir Mitchell' (Boston 1914); Williams, Talcott, 'Dr. S. Weir Mitchell' (in the *Century Magazine*, Vol. LVII, New York 1898). Consult also 'A Catalogue of the Scientific and Literary Work of S. Weir Mitchell' (Philadelphia 1894).

MITCHELL, Sir Thomas Livingstone, Scottish explorer: b. Craigend, Stirlingshire, Scotland, 16 June 1792; d. Darling Point, Sydney, Australia, 5 Oct. 1855. He served in Wellington's army in the Peninsular War from 1808 until the end of the campaign, obtaining the rank of major in 1826, and was sent to survey the battlefields afterward. His map of the Lower Pyrenees is still valued. This led to his publishing 'Outlines of a System of Surveying for Geographical and Military Purposes' (1827) and the appointment of deputy surveyor-general of New South Wales (1828). Between 1831 and 1846 he made four exploring expeditions discovering the Peel, the Namoi, the Gwyder and other rivers and traced the course of the Darling and the Glenelg. He was also the first to penetrate into the district that he named Australia Felix. On his last expedition, devoted to the discovery of a route between Sydney and the Gulf of Carpentaria, he explored the Fitzroy Downs, and discovered the Balonne, Victoria, Warrego and other rivers. Visiting England in 1838–39 he was knighted and made D.C.L. by Oxford. He took with him some of the first specimens of gold and the first diamond found in Australia. In 1851 he was sent to the Bathurst goldfields to make a report. In 1853 he again visited England where he patented his boomerang propeller for steamers. His publications chiefly relate to his explorations: ‹Three Expeditions into the Interior of Eastern Australia› (2 vols., London 1838); ‹Journal of an Expedition into the Interior of Tropical Australia› (1848); ‹Australian Geography› (1850); and ‹The Lusiad of Camoens Closely Translated› (1854).

MITCHELL, Walter, American Protestant Episcopal clergyman: b. Nantucket, Mass., 22 Jan. 1826; d. 1908. He was graduated from Harvard in 1846 and admitted to the bar in 1849, but deciding to enter the Episcopal ministry, received ordination to the priesthood in 1860. He held many important charges and was for a time chaplain of Kenyon College, Gambier, Ohio, until he retired from active service. He published ‹Two Strings to His Bow›; ‹Bryan Maurice,› etc.

MITCHELL, William, American astronomer: b. Nantucket, Mass., 20 Dec. 1791; d. Poughkeepsie, N. Y., 19 April 1868. He taught for a time, became cashier of the Pacific Bank in Nantucket, and interested in astronomy and mathematics, made a long series of investigations in connection with the United States Coast Survey studies of the figure of the earth. Besides lecturing on astronomy in Boston and elsewhere, he contributed to the *American Journal of Science,* and supplied time to whaling vessels. He received academic honors from Brown and Harvard universities and was elected to the American Academy of Arts and Sciences.

MITCHELL, Ind., a city in Lawrence County, 43 miles southwest of Columbus on the Chicago, Indianapolis and Louisville and the Baltimore and Ohio Southwestern railroads. Lime-kilns are among the chief industries. There are also mills for flour and timber. Pop. 3,438.

MITCHELL, S. Dak., city and county-seat of Davison County, is located on two divisions of the Chicago, Milwaukee and Saint Paul Railway, and 68 miles east by north of Sioux Falls. It was settled in 1879, incorporated as a city in 1883, and is governed under the general law charter of 1890 by a mayor who holds office for two years, and a council of eight members, four of whom are elected each year. The territory surrounding Mitchell is an agricultural district, producing principally corn and alfalfa, fruits and vegetables, while hogs, cattle, sheep and all stock, especially dairy herds, are found in great numbers. The city's grain products, etc., reach all of the Eastern terminals, Southern markets and Southern export markets and considerable stuff goes to the west coast and much to export via Puget Sound cities. The wealth of the city and county is reflected in its banks and trust companies, which have a combined capital, surplus and undivided profit of $934,479,84, with deposits over $4,000,000. Mitchell is the seat of Dakota Wesleyan University, a Methodist Episcopal Church State University and has well-equipped schools and churches. Pop. about 8,800.

MITCHILL, mĭch'ĭl, **Samuel Latham,** American scientist: b. North Hempstead, L. I., 20 Aug. 1764; d. New York, 7 Sept. 1831. He was graduated M.D. at the University of Edinburgh in 1786, and in 1788 was a commissioner for treating with the Iroquois Indians for the purchase of land. In 1792 he was appointed professor of chemistry, natural history and philosophy in Columbia College, where he first introduced the system of nomenclature invented by Lavoisier. In 1797 he founded with Dr. Edward Miller and Elihu H. Smith the quarterly *Medical Repository,* of which he continued the editor for 16 years. It was the first scientific periodical published in the United States. In 1801 he became a representative in Congress, and in 1804 was chosen to the United States senate. At the expiration of his term of office he was again elected to the House of Representatives. On the establishment of the College of Physicians and Surgeons he was appointed (1808) professor of natural history, becoming in 1820 professor of botany and materia medica. The institution in 1826 gave place to the Rutgers Medical School, of which Dr. Mitchill became vice-president. Though widely respected in his lifetime as a man of extraordinary learning and styled the «Nestor of American science,» he was occasionally the butt of the satirical wits of New York, and the poems of «Croaker & Co.,» to which Fitz-Greene Halleck was a contributor, contain records of some of his eccentricities. He proposed to change the name of this country to «Fredonia,» and wrote in 1804 ‹An Address to the Fredes, or People of the United States.› He was one of the early supporters of Robert Fulton, whom he accompanied in 1807 in the first steamboat journey on the Hudson. He was the author of ‹Observations on the Absorbent Tubes of Animal Bodies› (1787); ‹Nomenclature of the New Chemistry› (1794); ‹Life, Exploits, and Precepts of Tammany, the famous Indian Chief,› a half historical, half fanciful address before the Tammany Society of New York (1795), etc. Consult Francis, ‹Reminiscences of Samuel Latham Mitchill› (1859).

MITE, formerly a term applied to a very small coin worth about one mill. The name was used for a small coin current in Palestine in the time of Christ.

MITES, small parasitic members of the Arachnidan order Acarina, which also contains the ticks (q.v.), mange-insects and similar forms. The body is compact, not divided into separate regions, as head, thorax and abdomen; and they appear, as they are, greatly inferior to the spiders. They have eight legs, eyes useless, or nearly so, two spiracles only, and mouths with sharp, beak-like mandibles, fitted for biting or for piercing the skin of the animal on which they reside or prey by imbibing its juices. The mites undergo a metamorphosis, the larva passing through a series of changes varying with the species. The species are many, and are parasitic on a large variety of animals, and on mankind. In America, for instance, no less than 18 kinds infest poultry, of which the red mite (*Dermanyssus gallinæ*) and the chicken itch-mite (*Sarcoptes nutans*), attacking the feet, are the most commonly met with. A contagious disease among chickens is caused by a sort of mange-mite (*Cytodites nudus*) that flourishes in the air-passages, setting up inflammation of the lungs. The most serious disease of sheep is caused by the scab-mite (*Psoroptes communis*), varieties of which also produce "scab" in horses, cattle, goats and rabbits.

Household pests are the cheese-mites of two species that now have a world-wide distribution; but they will flourish equally well in other sorts of stored goods. A cheese once attacked will speedily be reduced to a powdery mass of mites, cast-off skins and excrements, the result of the amazingly rapid multiplication of the mites, and the fact that they produce living young. The new generation matures quickly and at once continues the production. When the stock of food is wholly consumed the youngest and oldest mites die, but those in vigorous middle age assume a scale-like quiescent form, called the hypopus stage, which is able to subsist indefinitely without activity or food. Finally a cockroach, mouse or some other small creature comes near enough to be seized by the hypopus, when it clings to a hair, crawls to the surface of the skin, begins to feed and sets up a new colony.

Of the mites inhabiting the human body the itch-mites (*Sarcoptes scabei*) is the most important and fortunately is disappearing. It affects a large number of hairy kinds of animals in all parts of the world, as well as man, and lives continuously on its host. The itching sensation denoting its presence is caused by the female mites burrowing beneath the skin, where the eggs are laid, and by the young feeding on the tissues before making their way to the surface in search of breeding-mates. Mange (q.v.) in dogs is the result of the presence of a similar mite (*S. canis*). Workers in copra are annoyed by related mites; and soft sugar is sometimes infested with mites of the genus Tyroglyphus, which cause "grocer's itch" in those who handle it. A common mite whose presence gives little if any trouble is the one (*Demodex*) found in the "blackheads," or blackish follicles that disfigure the noses of some of us.

That desperately annoying pest of autumn in some places, the minute red "harvest-bugs" of the genus Leptus, inhabit vegetation whence they attach themselves to man and other animals and begin to burrow in the skin causing an intolerable heat and itching, often resulting in bad sores. Consult authorities in Economic Entomology and Hygiene: especially Ealand, 'Insects and Man' (New York 1915). See TICK.

MITFORD, mĭt'fŏrd, **Mary Russell,** English writer: b. Alresford, Hampshire, England, 16 Dec. 1787; d. Swallowfield, near Reading, Berkshire, 10 Jan. 1855. Her education was obtained largely through her very wide reading. She won a lottery prize of £20,000 when three years old, with which her spendthrift father built a house at Reading. Owing to his extravagance, the family had to move to a laborer's cottage, and she to earning by her pen. Her first published work was 'Miscellaneous Poems' (1810). With the sketches 'Our Village,' descriptive of English rural life (first appeared in *Lady's Magazine,* 1819; collected 1824, 1826, 1828, 1830, 1832), she may be said to have originated a branch of literature. Among her dramatic works, five in number, 'Rienzi' (1828) was most successful; in America it became popular with Charlotte Cushman as Claudia. Included in her further writings are 'Recollections of a Literary Life' (1852), and the works of fiction 'Belford Regis' (1835) and 'Atherton' (1854), the latter highly praised by Ruskin. Her correspondence (published 1870) has been by some ranked almost with her books. Consult the 'Life' by L'Estrange (1870); ib., 'The Friends of Mary Mitford as Revealed in Letters from her Literary Correspondents' (1882); the correspondence with Boner and Ruskin, edited by Elizabeth Lee (1915); and Roberts, W. J., 'Mary Russell Mitford: The Tragedy of a Blue Stocking' (1913).

MITFORD, William, English historian: b. London, 10 Feb. 1744; d. Exbury, 10 Feb 1827. He was educated at Oxford, and obtained a commission in the Hampshire militia, of which he became colonel. His early fondness for Greek led him to the study of Greek historians, and he was induced, partly through the advice of Gibbon, a fellow-officer in the same regiment, to undertake a 'History of Greece.' The first volume appeared in 1784; the fifth and last, bringing the narrative down to the death of Alexander the Great, in 1818. With considerable critical acumen and diligent research he elucidated many obscure points, and until the appearance of the works of Thirlwall and Grote, his history was considered of the highest authority. A strong prejudice against democracy leads him to speak of the Athenians as a horde of treacherous miscreants, of Demosthenes as a malignant demagogue and of Philip as a perfect statesman and warrior. Mitford was professor of ancient history in the Royal Academy, and member of Parliament for three boroughs in succession 1785–1818. Besides his principal work he published an 'Essay on the Harmony of Language' (1774) and lesser works.

MITHAN. See GAYAL.

MITHRAS, mĭth'răs, in Perso-Iranic divinity, first the god of the heavenly light and the lord of all countries, afterward the sun, or the genius of the sun, which was worshiped as a deity by the Persians, and at a later period also in Rome. Mithras stands as a mediator between Ormuzd and the world, and was involved in the struggle with Ahriman, the evil power. He is commonly represented as a handsome youth, wearing the Phrygian cap, tunic and cloak, and kneeling on a bull, into whose throat he is plunging the sacrificial knife. The bull is at the same time attacked by a dog, a serpent and a scorpion. As the monuments of this worship were destroyed during the Mohammedan conquests, knowledge of its doctrines and rites is necessarily vague and uncertain; but it had some remarkable resemblances to Christianity. The worship of Mithras was formally suppressed in the 4th century. In Germany many tokens of its former existence are still to be found, as the monuments at

Hedernheim, near Frankfort-on-the-Main, and other places.

MITHRIDATES (mĭth-rĭ-dā'tēz) **VI**, surnamed EUPATOR, and also styled commonly THE GREAT, king of Pontus: b. Sinope, 134 B.C.; d. Pantacapæum, 63 B.C. He ruled from 121 B.C. until his death. He early entered on his career of conquest, which ultimately involved him in war with Rome. He subjugated the peoples on the northern shore of the Euxine (Black) Sea, attacked Cappadocia and Bithynia, and since these were allies of Rome, there encountered Roman opposition. After the death of Sulla, 78 B.C., Mithridates levied another army to expel the Romans from Asia. Being defeated by Lucullus, appointed consul 74 B.C., he was followed by the victorious Romans into his own states, and driven to seek refuge in Armenia, then ruled by Tigranes, who refused to deliver him up. Here Mithridates raised a third great army, and in 67 B.C. completely defeated the Romans; and, following up his success, rapidly recovered the larger part of his dominions. The Romans now invested Pompey with absolute power in the East, and by him, in 66 B.C., the forces of Mithridates were completely routed near the Euphrates. The king retired to Bosporus (the Crimea), where his troops headed by his son Pharnaces, broke out in mutiny, and Mithridates killed himself. He was considered by Rome its most formidable enemy. He was a patron of art and science, and is said to have spoken 22 languages. See POMPEY; SULLA.

MITLA, mēt'lä («the place of the dead»), Mexico, a village of the state of Oaxaca, on the Mixtecapan Plateau, 26 miles southeast of Oaxaca. It is celebrated for its extensive ancient ruins which comprise five great groups of temples, palaces, tombs and other edifices covering about 2,000 feet square and respectively known as (1) the Catholic establishment; (2) the Columns; (3) the Arrows; (4) the Abode; and (5) the South Side. They were elaborately decorated with admirable mosaic work in geometrical designs and with pictographic mural paintings. The ruins of a fort of the same architecture dominate a hill a short distance west of the city and in the vicinity are the quarries whence the stone for building the city was obtained. See MEXICAN ARCHÆOLOGY. Consult Saville, ‹Cruciform Structures near Mitla› (1900).

MITLAG-LEFFLER, mĭt'tag-lĕf'lĕr, **Magnus Gustaf**, BARON VON, Swedish mathematician: b. Stockholm, 16 March 1846. After studying mathematics in Upsala, Paris and Berlin he began to teach in Upsala where he obtained a degree in 1872. In 1877 he became professor of mathematics in Helsingfors and in 1881 at the University of Stockholm. Under the patronage of King Oscar he founded the *Acta Mathematica*, one of the leading mathematical journals in the world. He was several times rector of the University of Stockholm and became a member of the Academy of Sciences of Sweden in 1883. His mathematical writings deal chiefly with the theory of functions.

MITO, mē'tō, Japan, a town in the island of Hondo, seven miles from the east coast and 73 miles by rail northeast of Tokio. It is a town of considerable antiquity and has played an important part in the history of the country. There is an old castle and some fine public gardens. The manufactures include cloth, paper, for which it is famous, cigarettes, etc. Pop. about 35,000.

MITO, Doctrine of, said to be the creed of the Mito school of Japan from the middle of the 17th century to the overthrow of absolute power in the 19th century. This doctrine rested on the revival of the old learning of Japan, the honoring of the emperor and the expulsion from the country of «the barbarians» or foreigners.

MITO, or **MYTHO**, French Indo-China. See MYTHO.

MITOSIS, or **KARYOKINESIS**, the process of indirect nuclear division of cells undergoing growth or beginning those changes in the egg which bring about the growth of an embryo. This is almost universal, but «amitosis,» or direct cell-division occurs in pathological tissues and a few of the lowest organisms. The first stages are characterized by a rearrangement of the nuclear network into a series of loops or V-shaped bodies. Meanwhile a minute body in the cytoplasm, or extra-nuclear cell-contents, has divided into two, and the portions have arranged themselves at opposite poles, with the nucleus between them. Each of the two portions forms a star-like aggregation consisting of a centrosome with a radiating mass. The V-shaped bodies, or chromosomes, of the nucleus arrange themselves with their open ends outward and their closed ends near the centre, and they then separate along the central or equatorial plane, one-half proceeding to each centrosome, with whose rays it becomes incorporated and is firmly held. The cell then becomes constricted between the centrosomes, and in each of the two portions a new nucleus is developed by a process essentially the reverse of that just described. The final result is the formation of two daughter-cells out of the original mother-cell, each of which contains an exact half of the essential chromatin elements not only in respect to equal quantities, but in respect to those qualities, chemical or other, which constitute the inheritable individuality of the organism. For fuller information see CELL; EMBRYOLOGY; and consult the authorities cited under those titles.

MITRA, mē'tra (Sanskrit, meaning friend), an Indian god of light, belonging to the Vedic period. Mitra is the Friend, the personification of Daylight, a bright being beloved of man. His name is coupled with that of Varuna, another bright being. The association between them is so close that they present themselves to the mind as an inseparable pair — Varuna-Mitra or Mitra-Varuna, — who drive the same golden chariot and think the same thoughts. Together they are the keepers of the Cosmic Order and the Law of Righteousness, and together they watch the deeds and hearts of men, equally all-seeing and all-knowing. The sun is often called the eye of Mitra-Varuna as well as Varuna's alone; and Light is the chariot on which these two inseparable gods ride through space on their appointed path. They are also avengers and forgivers of sin. It is Mitra's particular business to wake men and call them to the duties of a new day. Only one hymn is addressed to Mitra alone.

The general character of the hymns of the Rig-Veda is as follows: «Mitra and Varuna, you mount your chariot, which is golden when the dawn bursts forth and has iron poles at the setting of the sun; from thence you see what is boundless and what is limited, what is yonder and what is here.» Varuna and Mitra are both Adityas, that is, sons of Aditi, who, in consequence, is called «Mother of the Gods.» She probably designates boundless space (*aditi,* space). Varuna and Mitra are, therefore, Sons of Boundless Space, Sons of Eternity, Sons of Beauty and Brightness, forgivers of sin, guardians of purity and truth, givers of health. They are thoroughly practical and beautiful deities. Mitra is identical with the Iranian Mithra, or Mithras, also a solar deity and the central figure of a special cult. See MITHRAS; AVESTA, and VEDIC LITERATURE.

MITRA, Rajendra Lala, Indian Orientalist: b. near Calcutta, 15 Feb. 1824; d. Calcutta, 26 July 1891. He came of the writer caste of Bengal and educated himself in his father's library, where he studied particularly Sanskrit and Persian. In 1846 he was made librarian of the Asiatic Society and devoted the rest of his life to this body, working as philological secretary, vice-president and president from 1885. The University of Calcutta gave him the degree of LL.D. in 1875 and he received the Companionship of the Indian Empire when that Order was founded in 1878. He became Raja in 1888. Besides numerous contributions to the *Journal of the Asiatic Society* and a series of Sanskrit texts entitled ‹Bibliotheca indica,› he published three important works, ‹The Antiquities of Orissa› (2 vols., 1875 and 1880); ‹Bodh Gaya,› the hermitage of Sakya Muni (1878); and ‹Indo-Aryans,› dealing with the manners and customs of the people of India from Vedic times (2 vols. 1881).

MITRAL VALVE. See HEART, THE.

MITRE, mē′trā, **Bartolomé,** Argentine soldier, politician and author: b. Buenos Aires, 26 June 1821; d. there, 19 Jan. 1906. In early manhood he found it discreet to leave the country, as his political poems were offensive to the dictator, Rosas, and he engaged in newspaper work in other parts of South America. He became the leader in the movement in which Buenos Aires proclaimed itself independent, 11 Sept. 1852, and was successively Minister of the Interior and of War in the Buenos Aires government. The force commanded by him was defeated by Urquiza at Capeda, 23 Oct. 1859, and Buenos Aires was reunited with the Argentine Confederation. In May 1860 he was elected governor of Buenos Aires. New troubles with the Confederation arose, and he defeated Urquiza at Pavon, 11 Sept. 1861. In 1862 he was elected President of the New Argentine Republic to serve for six years, and after a very prosperous administration became Minister to Brazil. He was defeated for the Presidency in 1874 and 1898, and was afterward elected to the Senate, of which he became president. He was the founder of an influential newspaper, *La Nacion,* and is one of the most noted writers Argentina has produced. His chief works are ‹Historia de Belgrano› (1857); and ‹Historia de San Martin› (1884), of which there is an abridged English translation (1893).

MITRE, *in ecclesiastics,* a sacerdotal head-dress worn by bishops and certain other Church dignitaries on solemn occasions, being a sort of cap pointed and cleft at top. There has been much controversy regarding the date at which the mitre became part of the official dress of bishops; but the general view is that it was not in use in the Church till the beginning of the 11th century. Some have contended that the early Christian Church adopted with little change the head-dress of the Jewish priests. Three kinds are worn in the Roman Catholic Church, namely, the precious mitre, of gold or silver and ornamented with jewels; the *mitra auriphrygiata* of gold cloth, without jewels (except pearls); and *mitra simplex* or plain mitre, of white silk or linen. Bishops and mitred abbots receive their mitres from the bishop who consecrates them. The Greek Church has no mitre properly so called. Since the Reformation the mitre has rarely formed a part of the costume of an English Church dignitary until within recent years, when it has been adopted by many bishops. See COSTUME, ECCLESIASTICAL.

MITRE-SHELL, the shell of a gastropod mollusk of the genus *Mitra* and family *Mitridæ,* closely allied to the *Muricidæ,* so called because of its resemblance in form to a bishop's mitre. The shells are thick, somewhat fusiform, with the spire very high and acute, and a small aperture and operculum. The genus is a very large one, comprising several hundred species mostly from shallow, tropical seas and especially abundant in the Malayan region. *Mitra episcopalis* is abundant on the tidal flats of the Philippine Islands. During the day, especially at low water, they burrow beneath stones or hide in crevices, but are active at night. They secrete a purple fluid having a nauseating odor and act as scavengers. Consult Cooke, ‹Cambridge Natural History› (Vol. I, 1895).

MITROVICZ, mĭt′rō-vĭts, Jugo-Slavia, also called Mitrovicza and Mitrowitz, town in Croatia-Slavonica, on the river Save in the county of Syrmia, 43 miles west of Belgrade. Roman remains have been discovered in the neighborhood and the city occupies the site of Sirmium, or Syrmium, the chief city of lower Pannonia under the Roman rule. The Emperor Probus (232–282) was born and buried at Sirmium; and here, according to some authorities, the noble emperor, Marcus Aurelius (121–180), died. Ecclesiastical councils of importance met in 351, 357 and 358 at Sirmium, which became an episcopal see in 305. In 1773 it was united with the diocese of Bosnia. The Huns sacked Sirmium in 441 and the Turks ravaged Mitrowitz completely in 1396 and 1521, destroying all the old buildings. A few ruins of the ancient Roman city are still to be seen. The country-side produces fruit, wine and grain, and the industries are chiefly the culture of silk-worms and tanning leather. Pop. about 12,909.

MITSCHERLICH, mĭch′ėr-lĭk, **Eilhard,** German chemist: b. Neuende, near Jever, Oldenburg, 7 Jan. 1794; d. Schönberg, near Berlin, 28 Aug. 1863. He was the son of a clergyman and nephew of the celebrated scholar, Christophe Wilhelm Mitscherlich (1760–1854). Going to Heidelberg in 1811, he devoted himself to philology and more particularly to Persian. In 1813 he went to Paris, hoping to obtain permission to join the embassy which Napoleon I was about to send to Persia. Political changes ended this plan and Mitscherlich then determined to study medicine in order to have the privileges accorded to physicians traveling in the East. He went to Göttingen to study medicine, and while there published a book on ‹Persian History,› compiled from manuscripts in the university library. It was printed in Persian and Latin (1814). While studying medicine in Göttingen, his attention was attracted to geology, chemistry and physics, and in 1818 he went to Berlin to work in the laboratory of H. F. Link (1767–1851). His researches led to the discovery of the law of Isomorphism (1819). Berzelius invited him to Stockholm (1820), whence he returned in 1822 to fill the chair of chemistry in Berlin. One of his earliest discoveries in Berlin was that of the double crystalline form of sulphur, one of the first observed cases of dimorphism. His investigations regarding the production of artificial minerals and his memoir on benzine and the formation of ether were also important. His principal work is ‹Lehrbuch der Chemie› (2 vols., 1829–1835, 4th ed., 1840–48). After his death his notes were published in the ‹Memoirs› of the Berlin Academy (1868). Consult Rose, ‹Eilhard Mitscherlich› (Berlin 1864) and ‹Erinnerungen an Eilhard Mitscherlich› (1894).

MITSUI, mēt-soo'ē, a name which has in Oriental financial circles a prestige similar to that of Rothschild in those of the West. The mercantile house of Mitsui and Company was established by Takatoshi (1633–1706), and has been identified with almost every large concern of industrial and economic interest in Japan.

MITSUKURI, mĭt'sū-kū'rĭ, **Kakachi**, Japanese zoologist: b. Edo, Japan, 1857; d. 1909. He came to the United States in 1873, received his Ph.D. from Yale in 1879 and Johns Hopkins in 1883; and, returning to Japan, became professor in College of Science, University of Tokio, in 1882. In 1893 he was made councillor of this university and in 1901 dean of the College of Science. In 1896 he was placed at the head of the fur-seal commission and signed a treaty with the United States and Great Britain. In recognition of his public service the Order of the Sacred Treasure was given to him in 1907. He was one of the leading zoologists of Japan and published a very important series of papers on the embryology of turtles (1886–96).

MITTERMAIER, mĭt'ẽr-mī'ẽr, **Karl Joseph Anton**, German jurist: b. Munich, 5 Aug. 1787; d. Heidelberg, 28 Aug. 1867. He was educated at the universities of Landeshut and Heidelberg. After serving as professor in Bonn in 1819–21, he became professor of law and jurisprudence in Heidelberg, which he held for the rest of his life. His greatest work is a complete manual of criminal law, ‹Das deutsche Strafverfahren in der Fortbildung durch Gerichtsgebrauch und Landesgesetzbücher› (Heidelberg 1845–46). He published a number of books and treatises on important questions relating to jurisprudence, trial by jury and the penal code. Many of these were translated into various languages. He was a member of the Baden legislature for many years; president of the Frankfort vorparliament; and representative of the city of Baden in the German National Assembly. Consult Mittermaier, ‹Bilder aus dem Leben von K. J. A. Mittermaier› (Heidelberg 1886).

MITTIMUS (from the Latin, we send), the name of a written warrant issued by an official and directing a proper officer to convey safely the body of a prisoner to jail or any other place of confinement until released by the due process of the law.

MITTWEIDA, Germany, a town in the kingdom of Saxony, 30 miles southwest of Dresden and 12 miles north of Chemnitz, on the Zschopau. It possesses a handsome Evangelical church, a classical, modern and technical school, cotton and spinning mills, and engineering and furniture works. Cigars and cement are also produced here. The town is chiefly Protestant. Pop., including Rössgen, about 17,800.

MITYLENE, mĭt-ĭ-lē'nē, **MYTILENE**, or **LESBOS**, a historic island of the Ægean Archipelago, off the northwest coast of Asia Minor, since 1913 belonging to Greece, and called by the Greeks *Mitilini* or *Mytilene*, from its capital. In shape it is nearly triangular, but on the south there are two deep and nearly land-locked bays; area, 675 square miles. It is mountainous (the highest peak, Mount Olympus, is 3,077 feet) but fertile and is one of the finest islands of the archipelago. The cultivated fruits include the olive, vine, fig, orange, pomegranate, apricot, pear and apple. The olive is the most important crop, large quantities of oil being produced. Wine, for which the island was anciently famous, is still made, but after antiquated methods. The chief exports are oil, hides, wool, valonia and fruits. There is excellent marble, deposits of iron, copper, alum, etc., and thermal springs utilized in the cure of rheumatism and nervous diseases. There are some tanneries, soap-works, numerous oil-mills, earthenware works, etc. The chief town is Castro, near to which are the ruins of Mitylene, the ancient capital. Pop. (estimate of 1914) 182,167.

The island anciently known as Lesbos was famous as a centre of Greek life and civilization. It formerly contained six cities, by far the most important being Mitylene and Methymna. It was early inhabited by Greeks of the Æolian race. Its inhabitants made an active resistance to the Persians, but were finally obliged to submit (about 540 B.C.). After the defeat of the Persians by the Greeks at the battle of Mycale (479 B.C.) it became the ally of Athens. During the Peloponnesian War it revolted from Athens, whereupon an Athenian fleet was sent against it, the walls of Mitylene were demolished and a thousand of the richest inhabitants put to death. The island itself was divided into 3,000 parts, of which 300 were devoted to the service of the gods, and the rest divided among the Athenians, by whom they were rented to the ancient proprietors. The cities, nevertheless, soon rebelled again. Alexander the Great made a treaty with the Lesbians after the battle of Granicus; the island was afterward reduced by the Macedonians and subsequently became part of the Roman province of Asia, and it was placed by Constantine in the Provincia Insularum. Saint Paul passed through the channel between the island and the mainland on his way from Corinth to Jerusalem (Acts xx, 14). In 1462 A.D., after belonging to a Genoese family, the island was taken by Mahommed II. During the War of Independence, the Turkish and Greek squadrons fought a battle off Mitylene 7 Oct. 1824, on which occasion the Turks were defeated and their fleet was destroyed. In consequence of strained relations between France and Turkey a French fleet was sent to Mitylene 5 Nov. 1901 and remained there till the Porte agreed in full to the demands made. As one of the islands occupied by Greek forces during the Græco-Turkish War of 1912–13, it fell to that power on the conclusion of peace.

The Lesbians in ancient times were notorious for their dissolute manners, and the whole island was regarded as the abode of pleasure and licentiousness. At the same time they had the reputation of the highest refinement and of the most distinguished intellectual cultivation. Poetry and music made great progress there. The Lesbian school of music was celebrated and is said to have produced musicians superior to all the other musicians of Greece. Among these the most distinguished were Arion of Methymna and Terpander of Antissa. Alcæus and Sappho, both Lesbians, were esteemed the first in lyric poetry. Pittacus (one of the seven wise men), the philosophers Theophrastus and Theophanes (the bosom friend of the great Pompey) and the historians Hellanicus, Myrtilus, etc., were also natives of this island. It was often chosen as a place of residence by distinguished foreigners. Epicurus and Aristotle taught there. Consult Tozer, 'Islands of the Ægean' (London 1890).

MIVART, mĭv'ạrt, **Saint George Jackson,** English naturalist: b. London, 30 Nov. 1827; d. there, 1 April 1900. He was educated at Harrow and King's College, London. Having joined the Roman Catholic Church in his 17th year, he thereafter received his academic training in Saint Mary's College, Oscott. In 1851 he was called to the bar at Lincoln's Inn, but the possession of ample means enabled him to gratify his taste for natural history. He was appointed lecturer on zoology in Saint Mary's Hospital Medical School in 1862, and from 1874 till 1877 was professor of biology in the Roman Catholic University College at Kensington. On the invitation of the Belgian bishops he accepted, in 1890, the chair of the philosophy of natural history in the University of Louvain. He was vice-president of the Zoological Society in 1869 and 1882, secretary of the Linnæan Society 1874–80 and its vice-president on two occasions (1880 and 1892). Among Mivart's contributions to reviews, etc., are those on 'The Structure of the Fins of Fishes,' 'The Osteology of Birds,' 'The Zoology, Anatomy, and Classification of Apes and Lemurs,' and his 'Memoir of the Insectivora.' He also published several important works on natural history subjects and the philosophical questions arising out of them. His best-known work is 'The Genesis of Species' (1871), in which, while fully admitting organic (though not mental) evolution, he argues against Darwin's theory of natural selection and attempts to explain the production of new species as due to an innate plastic power. Among his other works may be enumerated 'Lessons in Elementary Anatomy' (1873); 'Man and Apes' (1873); 'The Common Frog' (1874; new ed., 1881); 'Lessons from Nature' (1876); 'Contemporary Evolution' (1876); 'The Cat' (1881), a good introduction to the study of the vertebrate animals, especially the mammals; 'Nature and Thought' (1882); 'A Philosophical Catechism' (1884); 'On Truth: A Systematic Inquiry' (1889), in which he discusses the ultimate basis of science; 'The Origin of Human Reason' (1889), in which he insists on the fundamental distinction between man and all other animals; 'Monograph of the Canidæ' (1890); 'Birds: The Elements of Ornithology' (1892), a musical introduction; 'Essays and Criticisms' (1892); 'Types of Animal Life' (1893), all vertebrate and mainly mammalian; an 'Introduction to the Elements of Science' (1894). The articles in the 9th edition of the 'Encyclopædia Britannica' on Apes, Reptilia (Anatomy) and Skeleton were from Mivart's pen. He published anonymously a novel, 'Henry Standon,' republished shortly after his death under the title 'Castle and Manor.' Mivart's contributions to the study of the vertebrate animals, though not of epoch-making importance, were always valuable and luminous. In the latter part of 1899 and the beginning of 1900 he expressed himself with considerable freedom regarding certain doctrines of the Roman Catholic Church, and on his refusal to sign a declaration of faith submitted to him was inhibited by Cardinal Vaughan from taking the sacraments of the Church.

MIWOK STOCK. See MOQUELUNAN.

MIXED MARRIAGES, a name applied to marriages between persons of different religions. In the United States the term generally refers to a marriage between a Roman Catholic and a Protestant. In England a marriage between a baptized and an unbaptized person is ecclesiastically unlawful; one between a member of the Catholic Church and of any other Christian community is civilly valid, but ecclesiastically unlawful unless a dispensation is first obtained. If a Roman Catholic and a Protestant desire to marry, they must, according to Roman Catholic practice, promise that the children shall be brought up in the Roman communion; the bishop may then grant a dispensation and the marriage, without the nuptial benediction, must be performed by a Roman Catholic priest, no repetition of the ceremony by priest or clergyman of any other communion being tolerated. See NE TEMERE DECREE.

MIXED PROPERTY. That which is not altogether real or personal, but a compound of both, such, for example, as heirlooms, tombstones, etc.

MIXED RACES. Racial amalgamation, or crossing of the races, which begun in prehistoric times, has been continued into our own era with ever-increasing speed and complicity of results. Broadly speaking, any two races can unite to form a third race. As the process of amalgamation has been going on for so many thousands of years, an exhaustive classification of the existing mixed races is impossible. The types that stand out most prominently are the mulatto, the cross between the white and the negro; the mestizo, the cross between a European and the American Indian; the Eurasian, or Anglo-Indians, the mixture of English and natives; and the complex mixture found in the East Indian Archipelago, in which Chinese and Malayan types predominate. The results of racial intermarriage have been exceedingly variable. Sometimes it has produced a better race. This is the case when the crossing has been between different but closely allied stocks. «The Englishman,» writes Dr. J. G. Wilson, «who has resulted from the commingling of so many Teutonic tribes with the native Briton and Celt and the composite molded and directed by Roman culture, is, perhaps, the very best example of a good result from extensive crossing. Likewise the cross which has taken place in Ecuador, Mexico and Peru has produced a race of great promise. It is not so much a question of the possibility of producing a vigorous cross race under favorable conditions, as whether such a cross is, in itself, a desirable thing. The vital question is whether this inevitable amalgamation is worth the fostering care and regulation of our government. The answer to this question depends altogether upon what will be the results of this immigrant blood upon our own individual selves and upon our social and political institutions. When we come to consider the question of the influence of racial amalgamation upon our habits of thought, upon our morals and upon our institutions — upon our spiritual selves — we are confronted with a much graver problem. History is replete with instances where nations have lost their own peculiar form of civilization and political institutions on account of overwhelming alien influences. That the influence of the alien in the United States is enormous, and that it is yearly becoming more and more important, is almost a self-evident proposition. Whatever the race of people from which the immigrant comes, the final result is not to be feared so long as he does not come in overwhelming numbers. If he trickles in slowly we shall take care of him. Let him be what he will, the amalgamation will finally be complete. On the other hand, if we continue to let him come in what is practically unlimited numbers, we cannot take care of him. He will take care of us. We shall lose our inherited Anglo-Saxon ideals, and instead of a perfect amalgamation we shall confront the danger of a complete racial substitution.» It has been the misfortune of white civilization in its contact with the colored races in America, Africa and Australasia that both its worst products and its least desirable representatives were the ones first in the field. This has been an important factor in shaping the early relations of the races. It is the rover, the outlaw and the irresponsible trader who come first, and it is too often the contraband goods of civilization that they carry. It has been the rougher type of white also who has intermarried with native women and become the father of a hybrid progeny. There is a varying degree of adaptability and fusing power among the different branches of the white race in their relations with backward peoples. The Latin peoples in Europe have shown peculiar capacity for successful intermarriage with tropic races. Spaniards have crossed with fair success with both Indians and negroes in America and with Malays in the Philippines, as have the Portuguese with the two former types in Brazil. In the Spanish and French West Indies there is a greater proportion of mixed marriages than in the British West Indies and there are fewer evidences of social friction. Prejudice against the blacks is not confined to Europeans and Americans. The Chinese, the most cosmopolitan of peoples, sometimes exhibit a striking aversion to taking black wives, but manifest no particular aversion to the native women of Java or Borneo. East Indian laborers imported into the British West Indies and the British Guiana have sometimes interbred with blacks; but in British Guiana they are generally said to despise the negroes. Prof. U. G. Weatherly writes: «It is an unquestionable fact that the yellow, as well as the negroid peoples possess many desirable qualities in which the whites are deficient. From this it has been argued that it would be advantageous if all races were blended into a universal type embodying the excellencies of each. But scientific breeders have long ago demonstrated that the most desirable results are secured by specializing types rather than by merging them.

The color line is evidence of an attempt, based on instinctive choice, to preserve those distinctive values which a racial group has come to regard as of the highest moment to itself. Although sometimes based on a blind prejudice surviving from the primal instincts of periods of isolated savagery, it invariably has in it the core of a sound scientific truth, which is, that specialization is the law of efficiency. The fact that it is always the lighter race that puts the taboo on the colored and that the latter is every where eager to mix with the whites, is only an evidence of the general trend of choice towards the higher efficiency of the white race.» Consult Weale, B. L. Putnam, ‘The Conflict of Color’ (London 1910); Bryce, James, ‘The Relations of the Advanced and Backward Races of Mankind’ (Oxford 1902); Boas, Franz, ‘The Mind of Primitive Man’ (New York 1911); *Popular Science Monthly* (pp. 474–495, 1911).

MIXITE. A rare mineral, basic hydrous copper bismuth arsenate, $20CuO.Bi_2O_3.5A_2O_5.22H_2$. Occurs in very slender bluish green acicular radiating crystals and tufts in Tintic district, Utah.

MIXOGAMY (from the Greek words meaning mixed marriage), a term describing the breeding habits of fishes. Günther, in his ‘Introduction to the Study of Fishes’ (London 1880), describes mixogamous fishes as follows: «The males and females congregate on the spawning beds, and, the number of the former being in excess, several males attend to the same female, frequently changing from one female to another. Some Teleostei (*Ophiocephalus*), and probably all chrondropterygians are monogamous; and it is asserted that the connection between the pair is not merely temporary, but lasts until they are separated by accident.»

MIXOPHYTE, a term applied to plants that are capable of living independently or dependently upon dead organic matter. It is now definitely established that all green plants take up minute proportions of organic food. Many species attach themselves to the bodies of other organisms and derive all of their food supply from their host. Consult Macdougal, Daniel Trembly, ‹Practical Text-book of Plant Physiology› (New York, London, Bombay and Calcutta 1912).

MIXOSAURUS, a genus of small fish-lizards (*Ichthyopterygia*) from the Triassic formations of Europe, differing from typical ichthyosaurs by their fewer teeth and some minor characters.

MIXTEC, mēs'täk, or **MISTEC** («cloud people»), a Mexican tribe of Indians of the Zapotecan stock occupying the coast of Guerrero and the northwest of Oaxaca. They are highly skilled in agriculture and the simpler arts, have built cities and temples of hewn stone and possess a hieroglyphic literature, keeping a calendar like the Aztec tribes. They are noted for their pottery and woven products. Pop. about 200,000.

MIXTURE (from the Latin *mixtura*), a product of mixing, i.e., the amalgamation of different ingredients mutually diffused through one another. It also means the action of becoming mixed such as a mixing or blending of races. Mixture is, moreover, used to denote a preparation for medicinal purposes and in pharmacy is applied to potions of liquid medicine. Mixture is also used to denote «type-setting that calls for the use of two or more distinct faces, or faces and bodies of type.» Mixture is the opposite of solution.

MIXTURE, an organ stop. It is ordinarily furnished with from three to six small metallic pipes to each key and is compounded of the higher sounding and therefore shorter members of the foundation and nutation classes of stops, combined or mixed and arranged to draw together as in practice they are seldom required to be used separately. «The mixture,» writes an authority, «represents or corroborates the higher consonant harmonic sounds suggested by nature, and in the bass produces tones to the third or fourth octave above the major or chief foundation tone. As the musical scale ascends the higher harmonics become weak and inaudible to the ear; hence in a mixture stop it is customary to discontinue the higher ranks as they ascend, one or more at a time, and insert in lieu a rank of a lower tone than was previously in the stop but appearing as a separate stop.» This alteration is called a «break.»

MIZPAH, mĭz'pạ, or **MIZPEH**, the name of several places in Palestine. The word signifies a high place or lookout mentioned in the Bible. Mizpeh of Gilead (Gen. xxxi, 45) marks the site of the pillar and heap of stones put up by Jacob and his brethren in the mountains of Gilead in token of God being a witness to the covenant made between him and Laban. The «Mizpah ring» takes its name from this episode (see verse 49). The site is still pointed out with its group of rough stone monuments in the village of Sûf.— The Mizpeh of Benjamin (Josh. xviii, 26, etc.) lay north of Jerusalem on an unknown site.— That of Judah (Josh. xv, 38) stood north of Hebron and 20 miles south of Jerusalem. Nothing is positively known of the Mizpeh of Moab (1 Sam. xxii, 3).

MJÖSEN, myė'sĕn, **Lake**, Norway, situated in a picturesque and fertile valley, 36 miles northeast of Christiania, is the largest lake in the country. It is 62 miles long, with a maximum breadth of 10 and an average breadth of two miles. It is exceptionally deep, having a maximum depth of 1,460 feet. It is fed by the Laugen River and drains through the Vormen and Glommen into the Skager Rack. There are numerous popular summer resorts on its shores.

MLAWA, m'lä'vạ, Poland, town in the government of Plozk, 65 miles northwest of Warsaw on the river Mlaum, at the junction of the Marienburg-Mlawa and the Kowel-Mlawa railways. It has five churches, a 16th century town-hall, a custom-house of the first class and has importance as a trading point. It was founded in 1429 and was a wealthy city till the Swedish invasion. In 1910 it had a population of 18,652. In the World War the town fell into the hands of the Germans.

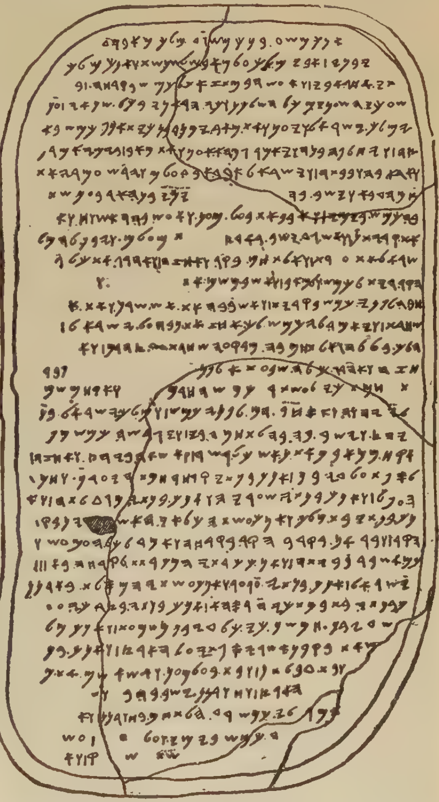
MNEMONICS, nē-mŏn'ĭks, a system of artificial aids for assisting the memory. Such methods have been in use for many years. They consist in the main of some mechanical scheme or framework which, by association, is linked with what one desires to memorize. One of the oldest forms of verbal mnemonics is contained in the familiar lines, «Thirty days hath September, April, June and November,» etc.; and many similar devices are known. The medical student has an unlimited number of mnemonic aids whereby to remember the names of the muscles, to call to mind the relation of important viscera and to determine accurately the order of the cranial nerves. Students of logic have for years made use of mnemotechnic devices to remember the parts of the syllogism. (See Logic). Some of these devices are based on topical association, whereas others depend on number and letter relations, and a great many which have been in vogue in recent years are based upon sound and rhyme relations. A general criticism that can be made of most of these memory-schemes is that the processes are purely mechanical, and that one of the fundamental features in memory, that is, memorizing for the sake of idea-relation, is given up for the sake of word-relation. For certain classes of students and for certain lines of work these mechanical schemes may be of much service; for salesmen, for instance, who need to bear in mind immense quantities of goods with their wholesale, retail and discount prices. But as a process of general culture, improving mind-facilities, so called, mnemotechnics are mechanical. See Memory.

MNEMOSYNE, nē-mŏs'ĭ-nē, in Greek mythology, the goddess of memory; the mother of the nine muses of Zeus. She was a daughter of Uranus.

MOA, one of a race of extinct ratite flightless birds of New Zealand, forming the family *Dinornithidæ* and composed of several genera (see Dinornithes) ranked between the apteryx and the epiornis. They had comparatively small heads, small eyes, bills of varied form, great legs, wings almost or quite wanting, and the head and neck bare. The feathers of the body were rounded, loose in part, downy, with great aftershafts. Some of the feathers were black with red-brown bases and white, others blackish brown or yellowish. They varied in size from that of a turkey (*Anomalopteryx parva*) so that of the huge *Dinornis maximus*, 12 feet in height. The remains of these birds are found in sand-dunes, bogs, caves and places where the aborigines had fed upon their flesh. Not only bones, but pieces of skin, ligaments, feathers and eggs have been recovered. It is probable, indeed, that these birds became extinct only four or five centuries ago. The Maori traditions recount the wars of extermination which their early ancestors waged with the moa; and the natives profess to show the spot where the last one was killed. Clearer traditions say that the habits of the birds were sluggish, but their disposition fierce. They lived in pairs, fed upon green shoots and fern-roots and made rude nests on the ground. Their anatomy was elaborately described in a memoir by Owen, ‘Extinct Birds of New Zealand’ (London 1879), and a general account of them may be found in Newton's ‘Dictionary of Birds’ (ib. 1896); and Rothschild's ‘Extinct Birds’ (ib. 1907).

MOAB, mō'ăb, the ancestor of a Semitic people who occupied a region east of the Dead Sea and the Jordan (its other boundaries varying) from an early period till the Christian era. In the Old Testament (Gen. xix, 37) he is said to be the son of Lot by his elder daughter. The “plains of Moab” spoken of in Numbers are the hot plains of the Jordan Valley. The region to which the Moabites were confined by the Amorites was strongly fortified on every side by nature, and was noted for its rich pastures and its wine. The institution of monarchy was of much earlier introduction among the Moabites than among the Israelites, but the religion of Moab seems to have been very similar to that of their more celebrated neighbors and kinsfolk. Their supreme god was Chemosh, who held among them much the same position as Jehovah among the Israelites and they seem to have had something akin to the priesthood and general theocratic organization of the Israelites, only that the inhabitants of conquered cities were massacred in his honor. The Moabites were for a time tributary to Israel, but regained independence in Rehoboam's reign. They were afterward harassed by the Assyrians, but at one period they assisted the latter against the Jews. Moab is mentioned about the 6th century A.D., but the people, as distinct from their neighbors, have long passed out of existence. The extensive ruins which now cover their country bear witness to their former greatness. The language of Moab was closely akin to that of Israel. Consult Tristram, ‘The Land of Moab’ (New York 1874); and Smith, George Adams, ‘The Historical Geography of the Holy Land’ (London 1897).

MOABITE STONE, *in archæology*, a monument of black basalt, about 3 feet 8½ inches high, and 2 feet 3½ inches wide, and 1 foot 1¾ inches thick, with rounded top but square base, on which there is an inscription of 34 lines in Hebrew-Phœnician characters, discovered in 1868 by F. A. Klein at Dhiban in the ancient Moab, just north of the river Arnon. An attempt made to purchase it led to a quarrel among the Arabs of the district, who thought to make more money out of it by selling it in pieces, and the stone was destroyed partially by being heated and then by throwing water upon it, which caused it to break into three large and several small pieces. The larger pieces were secured for the Louvre by M. Clermont Ganneau, an official connected with the French embassy at Constantinople, who was also fortunate in obtaining a paper impression of the inscription before the stone was broken. The inscription dates about 850 B.C., and is the oldest known in the Hebrew-Phœnician form of writing. It was erected by Mesha, king of Moab, and is a record of his wars with Omri, king of Israel, and his successors. The narrative also treats of Mesha's wars against the Edomites. Consult Ginsburg, ‘The Moabite Stone’ (1870), and Bennett, W. H., ‘The Moabite Stone.’



Moabite Stone.

MOBANGI, mō-băng'gē. See Ubangi.

MOBERLY, mō'bėr'lĭ, Mo., city, in Randolph County, on the Wabash and the Missouri, Kansas and Texas railroads, about 125 miles northwest of Saint Louis. It is an agricultural region, with valuable deposits of fire-clay and extensive coal fields. Some of its industrial establishments are the machine-shops of the Wabash Railroad, flour and lumber mills, ice factory, grain elevator, foundry and machine-shops, brick and lumber yards. The trade is chiefly in livestock, poultry, wool, tobacco, dairy products, hides and the local manufactures. It is the seat of Saint Mary's Academy, and has public and parish schools, a public library, a Young Men's Christian Association building and the hospital of the Wabash Employees Association. Moberly was laid out in 1866, incorporated as the county-seat in 1868, received in 1873 a city charter revised in 1889. Pop. (1920) 12,808.

MOBILE, mō-bēl, Ala., city and county-seat of Mobile County, situated on the western side of Mobile Bay, at the mouth of the Mobile River, 30 miles from the Gulf of Mexico and 50 miles below the junction of the Alabama and Tombigbee rivers. Mobile is 139 miles by rail from New Orleans; 179 from Montgomery on the Louisville and Nashville; Mobile and Ohio; Mobile and Bay Shore; Gulf, Mobile and Northern; Alabama, Tennessee and Northern; Southern; Pensacola; Mobile and New Orleans railroads.

General Plan.— The city is built upon a level, sandy plain from 6 to 35 feet above the river, rising gradually to the table lands 200 to 300 feet above sea-level, six miles west of the river, thus giving the fall required for efficient drainage. The streets are rectangular, many of them broad and shaded with live oak. magnolia, crepe myrtle, camphor and in some sections with pecan, dogwood, holly, sweet and black gum and sycamore trees. Government street noted for its fine homes, broad lawns and oaks. Dauphin street — West End — Reed and Ann, Georgia and Rapia, Old Shell road, Hall's Mill, Fulton, Cedar Point and other roads together with tours through the citrus, fig, pecan and trucking section surrounding the city are among the many inviting and interesting drives.

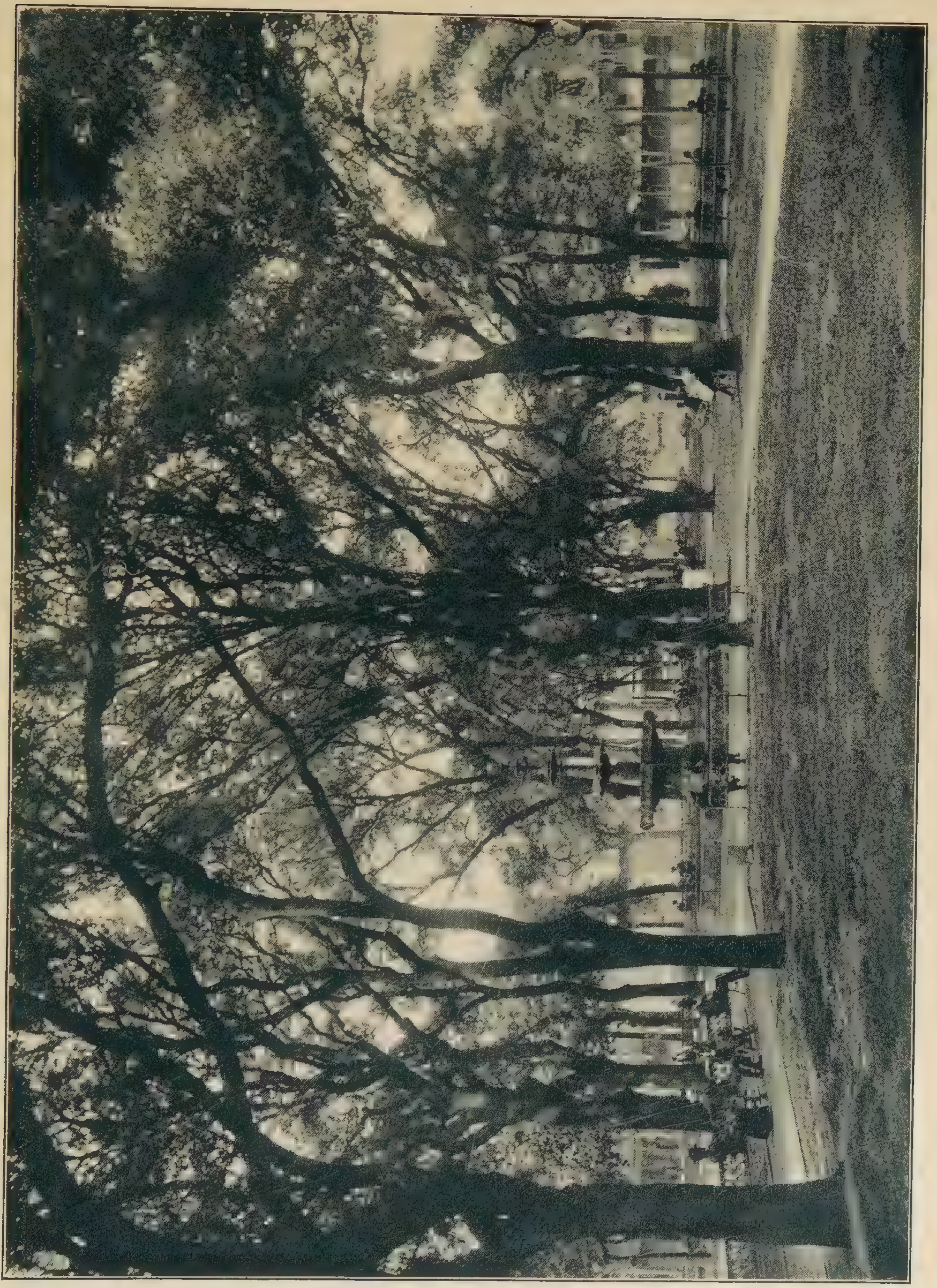
Public Parks.— Mobile has 13 public parks; Bienville, in the heart of the city; Monroe, fronting the bay; Washington, Oakleigh, Bay Shore, Arlington, Ryan, with statue of Father Ryan, the poet priest; Gulf Coast Fair Grounds and Race Track, Monroe Ball Park, Dixie, Eureka, Fearnway, the site of the monument commemorating the death of Eli Frohlichstein, who fell in the taking of Vera Cruz, Mexico, in April 1914; and Lyons, this latter fitted with all modern means for recreation. The Bay Shore Park acquired in 1915 has great natural resources and scenic beauty. In addition to the public parks, there are private parks open to visitors, Ashland place — the home of the late authoress, Augusta Evans Wilson — Flo Claire, Monterey place, Creighton, together with the children's public playgrounds on Church street, Duncan, on lower Government street, on which is Admiral Semmes' monument, also the Monterey and Reed lots for neighborhood children; while at Springhill is the fully equipped and popular Country Club.

Public Buildings.— The chief structures are the government building erected in 1852 at a cost of $379,564; the new post office, completed in 1916, constructed of Alabama marble at a cost of $425,000; county courthouse and jail, city buildings, including the city market, armory and drill hall. Mobile also has three modern railroad stations, Barton Academy, Masonic Temple, cathedral of the Immaculate Conception, McGill Institute, Springhill College, City Bank and Trust Company building, Christ Episcopal Church, Southern, Inge-Bondurant and Mobile infirmaries, Battle House, several theatres and modern hotels, Medical College of Alabama and Jewish Temple.

Educational and Charitable Institutions.— Mobile has 24 graded public schools for white and seven for colored children. For secondary and higher education it offers Barton Academy and Conti Street High School, Wright's University Military School and the Emerson Institute for colored pupils. In addition there are several Catholic and Protestant private schools, the most important being Springhill College, a Jesuit institution founded in 1830 There are five libraries, the Y. M. C. A., Mobile, Mobile public, Cathedral and Mobile County Medical Association. Charitable institutions include the Hannon Home for the Aged, Colored Old Folks Home, Protestant Orphan Asylum, Saint Mary's Catholic Female Asylum, Salvation Army Lodging House, Church Home, Benevolent Home for Old Ladies, Seamen's Bethel, etc.

Commerce.— Mobile is one of the leading cotton markets and shipping points of the country, the natural centre of the Alabama-Tombigbee cotton region, the nearest tidewater shipping port for the soft coal, iron, cement, lime, lumber, turpentine, resin and agricultural products of the southern, central and northern sections of Alabama and large amounts from upper Mississippi and lower Tennessee. A weekly line of large freight and passenger steamers plies the Mobile and Alabama rivers to Montgomery (410 miles) and to Demopolis, at the junction of the Tombigbee River (231 miles) and smaller vessels ascend the Warrior to Tuscaloosa (360 miles) and at high water to Columbus (380 miles) on the main stream navigable the year round. In addition to the regular lines, there are power barge lines which bring coal, iron and other products to Mobile, New Orleans and other Gulf ports. It is the third largest tropical importing city in the United States; has steamship connection with Europe, Cuba, Central America, Mexico, Windward and all Caribbean Sea islands, Brazil, the Pacific Coast of the United States, western coast of South America, Australia, New Zealand, Hawaiian Islands, Japan and China, via the Panama Canal, to which Mobile is the nearest, deep, fresh water railroad connected city in the United States, situated far enough inland to be beyond the reach of any gun fire from ships on the high seas. Mobile's imports for the calendar year 1913 were valued at $3,675,180. Its exports were $44,238,747. For the calendar year 1915, the total imports were $3,443,228, and the exports $21,317,683, the export figures not including the 84.798 long tons of bunker coal furnished vessels at this port and valued at $256,133. It will be noted above that the exports for the year 1915 are less than half those for the year 1913. This was mainly due to the European War, the calendar year ending 31 Dec. 1916 showing exports to be $30,627,633 and the imports $3,997,317, showing still the effects of the war, though trade is rapidly being recovered, the trade with Cuba, West Indies and Central America, increasing by leaps and bounds, beyond all former ratios, its trade with Cuba being second only to that of the port of New York. The calendar year ending 31 Dec. 1917 shows Mobile's imports to have been $2,873,680, and its exports $35,010.182. Mobile's trade territory from which to draw materials for export, is rapidly being extended and the

MOBILE, ALABAMA



Bienville Square

same is true as to imports. The above figures include for exports cotton and subsidiary products, coal, coal oil, crude oil and by-products, iron, iron pipe, cement and cement products, lime, whiting, fuller's earth, lumber and allied products, tar, turpentine, resin, livestock, canned foods and other canned products, flour, lard, salted and pickled pork, salt, soap, cotton goods and notions, gun shells and other ordnance stores, general foundry and machine-shop products, agricultural and mill machinery, belting and other mill supplies, fire and burglar-proof safes, scales, talking, typewriting, computing and other machines, also store and office furniture and fixtures, electrical supplies, hardware, cordage and ship supplies, hay, grain, garden, flower and field seed, household furniture, sewing machines, musical instruments. Among its imports, are Cuban magnetic iron ore, zinc, ammonia sulphate, sulphur ore, iron pyrites, sodium nitrate, fire brick, tropical fruits and other products, coffee, molasses, sugar, sisal grass, chicle gum, mahogany logs and lumber, iron, satin, sandal, lignum vitæ woods, dye woods, cork, cigars, Cuban tobacco, Peruvian bark, opium and other drug materials, camphor, sponges, bird lime, dried bone, phosphate rock, asphalt, lemons, limes, olives and olive oil, raisins, currents, nuts, prunes, matting, bamboo poles and rods, together with a miscellaneous line of embroideries, laces, rugs, toys, etc. The importation of Cuban molasses or black strap, as it is now called, used in the making of stock feed and explosives, has increased to a greater extent than any other article of late years.

Industries.— The city's industries include manufacturing jewelries, lithographing, engraving, printing and book-binding establishments; newspapers, the Mobile *Register* — morning daily — established in 1812; the *News-Item* — evening week day; the *Advocate* and the *Press,* these two being colored weeklies. There are three cotton compress warehouses, one having two of the most powerful and rapid presses in the world, two cotton mills, one with 10,000 spindles, making knitting and weaving yarns, the other mill running 16,000 spindles and making a wide range of cotton goods; a knitting mill, overall and clothing factory, several saw mills, the output of which ranks Mobile as the third largest exporter of mill production in the South, a cottonseed-oil mill, cotton pickery, black strap stock feed mill, abattoir and packing-house, fertilizer plants, turpentine distilling plants, wood working plants, cooperage, sash, door and blind factories, two of the largest cedar, cigar box and veneer mills in the world, making 80 per cent of the entire output of the country, metal working machine shops and foundries, hoe factory, oxy-acetylene welding works, aeroplane and motor factory, saw and brass works, copper workers, corrugated conduits, containers, resin recovery works, metal box factory, steam boiler works, stove, car wheel, pulley and gunshell foundry and machine shop, trolley and steam railroad car shops, ship and boat repair plants and slips, floating dry docks, one of the latter being the largest marine dock south of the government dock on Chesapeake Bay and another of sufficient capacity to take in government ships of the greatest size. The Chickasaw Shipbuilding Company — a subsidiary of the United States Steel Corporation — has established a $10,000,000 plant upon the Mobile River, where ways have been set up and ships of iron and steel are under construction. In addition to this, there are five other large shipbuilding companies, three ice factories, ice cream, candy, fruit products company, broom and brush factory, coffee and spice mills, creamery, chewing gum and proprietary medicine manufactures, peanut butter factory, trunk, bag, leather and carriage factories, leather belting company, art glass and tile works, terracotta, brick, drain pipe and pottery plant, paint mills, roofing and cornice work, brass foundries. Mobile has two electric light and power companies, one operating 60 miles of street car service, the other furnishing light, heat and power, two telephone companies and one gas company, these being privately owned, the Mobile and Ohio Railroad Company owning and operating the grain elevator, having a 250,000-bushel capacity. The International Harvester Company has long been importing, through this city, its sisal grass with which it has made its binder twine and has also established a cordage factory for the manufacture of ropes of all kinds and sizes. The fish and oyster, crab and turtle industries are also important and growing industries.

Revenues, Banking, etc.— For the year 1916 the revenue of the city of Mobile — other than receipts of paving assessments, from waterworks and other than special tax for the payment of the refunding bonds — was as follows: Taxes for general purposes, $258,474.71; business licenses, $109,684.49; city wharves, $24,382.31. Receipts from various other sources not specified above, $106,292.45, making a total of $498,834.96. The city is living within its income and even anticipating its obligations, at the same time steadily improving in all departments; the funds obtained from the issue of bonds amounting to $600,000 are being used in constructing docks and terminal railway connecting these docks with railroads entering the city. These bonds, authorized by an election held 13 Aug. 1917, draw 5 per cent per annum interest, payable semi-annually, May and November, and run for 30 years. In addition to this municipal increment to the city's enterprise, is a freight handling device known as the Telpher system, in which the city has a financial interest, with option to take it over at a later specified date. The assessed valuation for 1915–16 amounted to $35,911,654 and the city is authorized to issue bonds aggregating 7 per cent of this amount to be expended for purposes other than schools, waterworks sewers, etc. The total bonded debt of the city under this provision is $1,664,950. The city has five banks; the First National, established 1865 and the oldest in the State, capital $300,000, resources $9,271,121.36, surplus and profits $658,363.38; the People's Bank, capital $200,000, resources $5,000,000, surplus (earned) $200,000 and undivided profits $100,000; Merchants' Bank, capital $150.000, resources $3,478,530.41, surplus and undivided profits (earned) $262,909.51; Union Savings Bank, capital $35,000, resources $305,054.74, surplus and undivided profits (earned) $19,215; The Farmers' and Mechanics' Bank of Mobile, capital $100,000, surplus paid in $10,000, organized 1917.

Government.— Mobile is under the commission form of government, which went into operation 14 Aug. 1911, and three commissioners were elected to serve one, two and three years respectively; the terms of all having expired, they have been re-elected, the time of service being extended at each election, the elections in the future to be for a term of six years, the time of one commissioner expiring at the end of every second year. The commission form of government has proved to be in every way more satisfactory than the former method of a mayor and council. Pop. about 51,521, or including the suburbs Creighton, Pritchards, Plateau and Whistler, about 63,000. Pop. in 1917 estimated to be 72,000.

History.— Mobile Bay was visited by the Spaniards in 1511 and was the original seat of French colonization in Louisiana. The illustrious brothers Le Moyne d'Iberville and Le Moyne de Bienville in 1699 founded a temporary settlement on the back bay of Biloxi, Mississippi, but in 1702 moved it to Mobile River, 27 miles north of the bay, where occuried the «petticoat insurrection» of the women against too much corn meal diet. On the western façade of the city buildings, on South Royal street, is a bronze tablet with the following inscription: «The city his monument. Jean Baptiste le Moyne. Sieur De Bienville 1680–1768. Who on this spot began building Fort Louis De La Mobile. The First Capital of the Province of Louisiana. May A.D. 1711. Erected by the city of Mobile May 1911.» In 1711 a flood and hurricane nearly destroyed the place and the settlement was removed to the present site. The origin of the word Mobile is obscure, Judge Hamilton thinks it of Chocktaw derivation and means «paddling.» Mobile remained the capital until 1722 when New Orleans was given that designation. In 1763 Mobile passed into British hands and the name of Fort Condé was changed to Fort Charlotte. In 1780 the Spanish General Galvez captured it and the right of possession was confirmed to Spain by the treaty of 1783. On 13 April 1813, it was captured by the American General Wilkinson, then in command in New Orleans and for the first time the flag of the United States waved over Mobile. Fort Bowyer at the mouth of Mobile Bay was retaken by the British but again given up. Mobile was incorporated as a town 20 Jan. 1814; as a city, 17 Dec. 1819. In 1818 the Bank of Mobile was founded, which in the panic of 1837 was one of the four United States banks which did not fail. In 1818 steamboats were operated on the rivers and in 1839 the city was nearly destroyed by fire and ravaged by yellow fever and again in 1852 by flood and in 1853 by fever. On 4 Jan. 1861 the State authorities took possession of Forts Morgan and Gaines at the mouth of the harbor, though the State did not secede from the Union until 11 January. On 5 Aug. 1864 Farragut entered the harbor, bombarded the forts and destroyed the bulk of the Confederate fleet, including the ram *Tennessee.* Farragut captured the forts and Mobile surrendered to General Canby on 12 April 1865. Upon the reestablishment of Federal control, the government inaugurated great improvements in the harbor, widening and deepening the channel from 13 to 23 feet by 1903 and up to 1916 the channel had been deepened to 30 feet over the bar and up to the city, with a width of 250 feet. During the «Reconstruction Period» the city became bankrupt and on 11 Feb. 1879 its charter was canceled and its name changed to «Port of Mobile.» On 10 Dec. 1886 a new charter was given and the old name restored. Since the close of the Civil War, the city has been called the «City of Five Flags,» that of the Confederacy being the fifth to wave over the city. The lower part of the city was inundated in 1906, when a severe gale from the sea caused the water to back up in the bay. A number of lives were lost and much property ruined. The population in 1920, according to the United States census, was 60,777. Consult Hamilton, P. J., 'Colonial Mobile' (Boston 1910); id., 'Founding of Mobile 1702–18' (Mobile 1911); Powell, L. P., 'Historic Towns of the Southern States' (New York 1900).

EDWARD QUINCY NORTON.

MOBILE, a bay on the southeast coast of Alabama, forming an estuary into which, through the deltaic mouths of the Mobile and Tensaw branches, flow the waters of the Tombigbee and the Alabama rivers. That part of the estuary to which the name of Mobile Bay is applied is about 30 miles long and from 9 to 12 miles wide. At the entrance to the bay are long narrow strips of land, almost obstructing the entrance. On the east, at Mobile Point, is a revolving light; on the west, on Dauphin Island, are Forts Morgan and Gaines. Between Dauphin and the mainland is Grant's Pass, a strait connecting Mobile Bay with Mississippi Sound. The United States government has improved the harbor, and from a shallow entrance, which was a hindrance to navigation, there is now a channel through which vessels drawing 23 feet and over can enter, and vessels drawing 17 to 23 feet can ascend to the wharves of Mobile city.

MOBILE, a river in Alabama, the name given to the western stream or mouth of the river formed by the junction of the Alabama and Tombigbee rivers. The eastern stream or mouth is called the Apalachee or Tensaw. From this junction of the rivers to the head of Mobile Bay is, in direct line, about 25 miles, but the winding of the stream makes its course about 50 miles long. The Mobile and Tensaw communicate at several points, but the two streams enter the Mobile Bay at the city of Mobile, by the same delta.

MOBILE BAY, Battle of, a battle of the Civil War fought 5 Aug. 1864. Mobile Bay is divided from the Gulf of Mexico by Mobile Point east and Dauphin Island west, about three miles apart; but the ship-channel of less than 2,000 yards, narrowing to 750 outside, closely skirts Mobile Point. The latter was defended by Fort Morgan; the island by Fort Gaines, too far from the channels to be very formidable. Between them stretched a line of piles and torpedoes, but leaving a narrow channel for blockade-runners, marked off by a red buoy. Within was the Confederacy's most powerful ram, the *Tennessee,* and three small unarmored paddle-wheel gunboats. Farragut's Federal fleet (in order of battle) comprised the monitors *Tecumseh, Manhattan. Winnebago* and *Chickasaw,* forming an inshore column; and the wooden sloops of war *Brooklyn, Hartford* (flagship), *Richmond, Lackawanna, Monongahela, Ossipee* and *Oneida,* forming an outer one, each with a smaller mate lashed to the port side, to ensure passage through if the starboard vessel's machinery should be disabled. Farragut would have led in the *Hartford,* but the *Brooklyn* had machinery for picking up torpedoes. The advance began at 5.30 A.M., and firing at 7.05; the instructions were to keep east of the red buoy, but the *Tecumseh* went west and was sunk by a torpedo. The *Brooklyn* stopped in fear of a like disaster, and the *Hartford* with Farragut passed her and led the fleet into the bay. Each vessel received much damage from Fort Morgan, but they silenced its guns by destructive fire, and all succeeded in anchoring three miles up. One Confederate gunboat was then sunk, one captured and one took refuge next the fort; the *Tennessee* was to be attacked after dark, but itself assailed the flagship, and after a desperate fight was disabled and surrendered. The *Lackawanna* collided with the *Hartford* and nearly sunk her. The Union fleet lost 52 killed, 170 wounded and 113 drowned in the *Tecumseh;* the Confederates 10 killed, 16 wounded and 280 prisoners, besides the casualties in the fort. Both forts surrendered a few days later. The Union fleet carried 159 guns, and the officers and crews numbered 3,000 men. The Confederate fleet carried 22 guns and 470 officers and men.

MOBILE BILL. See BOUNDARIES OF THE UNITED STATES.

MOBILIER, Crédit. See CRÉDIT MOBILIER.

MOBILIZATION, the act of bringing an army to a war footing, before the concentration for war, which consists in the distribution of troops along the hostile frontier in such a manner that they may be available for action. Mobilization consists in the call for men and the requisitioning of animals, the assembly of men and animals in mobilization camps and their division into field, depot and garrison troops. The mobilization of the German Army in 1870 is typical of the processes involved. In the first place, a plan of mobilization was drawn up for each year, and all the superior officers were supposed to keep on file all orders necessary for carrying this plan into effect. Tables of transportation were also kept in readiness, and on the declaration of war nothing was necessary but to carry the orders and tables into effect. Since the disposition of recruits and the distribution of the various forces at points of mobilization was determined in advance, it was possible to mobilize much faster than the enemy and to gain the advantage of the first blow. When the order of mobilization was issued, it was to be immediately telegraphed to the commanders of districts, from which the landwehr battalions were recruited. The landwehr soldiers, according to the scheme, were immediately notified to report within 24 hours. By the end of five days they reached the points of mobilization. By that time the purchase of remounts was accomplished in a similar manner. The distribution and equipment of troops consumed another day or two, and by the seventh day of mobilization, the infantry and cavalry were ready to take the field. The artillery and the train were ready by the eighth day. Instructional organizations were preserved as far as possible. This was the plan of mobilization: the result was that infantry regiments were mobilized in from seven to nine days; cavalry, in from 9 to 11 days, and the other services in 15 days.

It will be seen that speed and system were the two guiding principles of the German mobilization of 1870. This method of a rapid mobilization according to schemes prepared in time of peace has been adopted by all the armies of the world, and most especially by the great conscript armies. Armies such as the British and American were at the beginning of the Great War require a much longer and consequently more dangerous process before they can enter the field. The United States could only avail itself of its regular army for anything like immediate use, and even that did not enter the field for over six months. The militia had to be recruited up to strength, reorganized and trained. There was not a sufficient supply of officers, and so officers' training camps for civilians were opened. Ammunition, ordnance, uniforms and other equipment had to be manufactured. Large bodies of civilians were drafted and trained in great cantonments. At the end of a year the mobilization was only partial and did not seem likely to be completed for a considerable period. This is to be contrasted with the German mobilization in 1914, which rendered 1,850,000 men ready for service in six days, the French mobilization, which produced an army of 1,380,000 men in two weeks, and even with that of Russia, which increased the regular army of 1,200,000 by 650,000 men in a month. Consult the field service regulations of the various great armies of the world.

MOBY DICK, or ‹The White Whale,› by Herman Melville, is a strange, conglomerate book, embodying much lore that the author had acquired during whaling voyages in almost every ocean, and by long study of almost everything directly or indirectly concerned with whales and the whale fisheries. As a romance, it tells of the cruise of a Nantucket ship commanded by a crazed captain whose one thought is the capture of the ferocious monster that had maimed him on an earlier voyage. Relatively few, however, of the 135 chapters are occupied with the account of Captain Ahab and his search for the white whale, Moby Dick. The author gives exciting accounts of the pursuit and capture of whales under various conditions. He describes in detail the equipment of a whaling vessel and traces the complicated processes of cutting up the carcass, trying out the blubber and securing the sperm oil. He gives much scientific information regarding the habits and the anatomy of whales, intermixed with ingenious and sometimes facetious speculations of his own, and he has much to say of the whale in legend and in literature. He also portrays vividly many members of a whaling crew that included American Indians, negroes, East Indians and South Sea islanders, as well as Europeans of several nationalities. The book will prove disappointing to the reader who is impatient of delays and digressions in a story, but it contains few pages that are not interesting in themselves; and the effect produced by the mixture of erudition. speculation, poetical rhapsody and narrative of real and imagined occurrences is most impressive.

WILLIAM B. CAIRNS.

MOCCASIN, MOCCASON, MOCASSIN, or **MOCCASSIN,** originally a deerskin sandal, the sole and upper of which are formed of one piece of leather. It was formerly the ordinary foot-covering worn by the North American Indians. In recent times fancy moccasins are made for the general shoe trade, all kinds of leather being utilized for the purpose.

MOCCASIN-FLOWER, a name for the American orchids (q.v.) of the genus *Cypripedium*, especially the large pink *C. acaule*, given to them by the Indians in allusion to the shape of the inferior part of the flower. Lady's-slipper is a common English name of the same import. See ORCHID.

MOCCASIN SNAKE, or **COTTON-MOUTH**, a large venomous serpent (*Ancistrodon piscivorus*) of the rattlesnake family, but having no rattles, the tail ending only in a horny spike, like that of its near relative, the copperhead (q.v.), sometimes called «upland moccasin.» The body is stout in proportion to length (about 4 feet); the head is chunky and distinct from the neck. It inhabits river-banks, swamps and fresh-water marshes throughout the southern half of the United States, swarming in some regions, like the Everglades of Florida, or the half-flooded woods of lower Louisiana, and constantly invading the rice-fields. Elsewhere it is not greatly to be feared, as it rarely leaves the edge of the water, where it is fond of lying upon some low overhanging bush or floating log, ready to drop upon the fishes and frogs, which form its principal food, and which it pursues with great speed in and under the water. It often reaches a length of four feet, and its bite is deadly, the widely opened mouth in the act of striking showing cottony white. Its color is a dark reddish brown, obscurely marked with blackish, and with white blotches on the lips and abdomen. Seven to 12 young are produced annually, viviparously; these are frequently captured, and though they thrive in captivity, never yield any of their native sullen ferocity. One of the most complete biographies of this snake is that by Stejneger in the ‹Annual Report› of the Smithsonian Institution for 1893. Consult also Ditmars, ‹The Reptile Book› (New York 1914).

MOCHA, mō'kạ (Arabian, mō'ʜä), or **MOKHA**, Arabia, a fortified seaport, the former capital of Yemen, on the Red Sea, 130 miles northwest of Aden. During the 16th and 17th centuries Mocha was the chief port and emporium from which the coffee of Yemen was exported, whence the proverbial term «Mocha coffee.» The trade has been diverted to Hodeida and Aden. Pop. about 4,800.

MOCK ORANGE, a name applied in England to the Syringa (q.v.), and in the United States to the *Prunus caroliniana*, a small evergreen resembling the cherry-laurel.

MOCKER-NUT, a species of hickory (q.v.)

MOCKING-BIRD, a familiar and celebrated songster of the southern part of the United States (*Mimus polyglottus*), representing a genus of thrush-like wrens, many other species of which are known in Mexico, Central America and West Indies. North of Delaware it is seldom seen outside a cage; but even in winter they are sometimes seen in Central Park, New York, and they are fond of human society. The plumage of all is bluish-gray and white, with no striking ornaments but much elegance of outline and tint. Their habits differ little from those of thrushes and other migratory, insect-eating birds, but they show great courage in defending their nest (generally of four to six eggs), placed usually in a bush or small tree, against cats, snakes and similar enemies. The young, when taken from the nest for domestication, should be removed at an early period; or if taken later, they are generally removed by means of trap-door cages. The ordinary song notes of the mocking-birds are clear, bold and varied. They sing during the night, like the nightingales, and appear to begin their song with the rising moon. The imitative notes of these birds are, however, still more varied than their natural tones. They mimic with success the songs of their feathered neighbors and with such exactitude as to deceive the ear of the most experienced sportsman. When they are kept in confinement all the sounds of the household, as well as the mewing of cats, the barking of dogs, the cry of an injured chicken and the screech of the hawk are all exactly imitated. They are hardy and require only ordinary care and attention to live contentedly for many years in any moderate climate. The mountain mocking-bird (*Oroscoptes montanus*) of the Rocky Mountain region and the various «thrashers» (q.v.) are relatives not greatly inferior in song; while the mocking-wren (see WREN) is a more distant relative highly gifted in imitative powers.

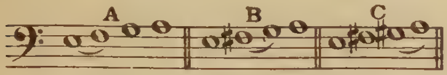
MOCKLER-FERRYMAN, Augustus, English military expert and author: b. Ireland, 1856. He was educated at Cheltenham College and Sandhurst, and entered the army in 1876. From 1900–03 he was professor of topography at Sandhurst Military College, and he acted as map editor on the British official history of the South African War (1903–07). He was employed as General Staff Officer, 1st Grade (1914–16). He has published ‹Up the Niger: Narrative of Maj. Claude Macdonald's Mission› (1892); ‹In the Northman's Land› (1896); ‹British West Africa› (1898); ‹Annals of Sandhurst› (1900); ‹British Nigeria› (1902); ‹Oxfordshire Light Infantry Chronicle› (21 vols., 1892–1913); ‹Military Geography of the Balkan Peninsula› (1905); ‹Regimental War Tales› (1915).

MOCQUEREAU, mŏk'kė-rō', **Dom André**, French musician: b. La Tessouale, near Cholet, 6 June 1849. He was educated at Paris, where he appeared as cellist in the chamber-music concerts given by Charles Dancla. He entered the Order of Benedictines at Solesmes (1875), studied there, under Dom Pothier, Gregorian melody and was soon appointed instructor. He was the originator (1889) and is director of *Pabéo graphie musicale*, a periodical devoted to the research and publication of photographic reproductions of the oldest important examples of church melodies and their history (10 vols. by 1915). Other works of his are ‹Livre d'orgue› (1898); ‹Petit traite de psalmodie› (1897), translated into several versions; ‹Methode de chant grégorien› (1899).

MODDER, or **KAIBA, RIVER**, South Africa, a tributary of the Vaal River, joining the latter about 30 miles above its confluence with the Orange River. It has an eastward course of over 180 miles. It came into considerable prominence during the Boer War of 1899–1902; along its banks at Maagersfontein the British were driven back with great loss in 1899, and at Paardeberg the Boer general, Cronje, surrendered in 1900.

MODE, *in music,* (1) the manner of arranging the tones and half-tones in a scale, this general designation being always accompanied by a qualifying adjective, as Dorian mode, minor mode. Greek music, from which our modern music has been evolved, had an elaborate system of nine modes, which were afterward extended to 15. Authorities vary considerably as to the differences between the modes; it is certain, however, that they were the outgrowth of an earlier Greek music, the basis of which was the tetrachord. A tetrachord is a short scale of four notes, one of the intervals being a half-tone and the others whole tones, for example:

1



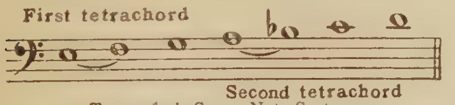
(A) Dorian tetrachord, half-tone, $\frac{1}{2}$; (B) Phrygian tetrachord, half-tone, $\frac{2}{3}$; (C) Lydian tetrachord, half-tone, $\frac{3}{4}$. The slur indicates the half-tone.

The tetrachords were probably named after the people that originated them.

Until the time of Terpander (7th century B.C.) all Greek music seems to have been confined to the limits of a tetrachord. The lyre, which was then used merely to give the singer the pitch, had but four strings, each capable of sounding but one note. It was tuned in one of the ways shown above, though the notes written should be understood to be merely relative, each singer tuning his lyre to suit his own voice.

Terpander increased the compass of the lyre by adding a second tetrachord to the first, using the highest note of the first for the lowest of the second, thus making an incomplete scale of seven notes.

2

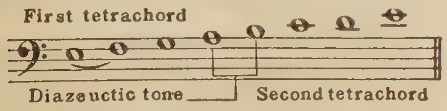


Terpander's Seven Note System.

The middle note, A, belonging to both tetrachords, was called *Mese* (middle) and had somewhat the function of our modern keynote. It will be noted that the two tetrachords are both Dorian, which was the characteristic and favorite Greek tetrachord rather than the foreign Phrygian or Lydian.

Pythagoras (582 B.C.) is the reputed author of the octave system (the foundation of our modern system). He probably learned it during his visit to Egypt, where it is said to have been in use for many centuries before. By this system the two tetrachords, instead of having a note in common, were separated by a whole tone, called the diazeuctic tone or tone of disjunction.

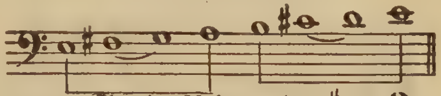
3



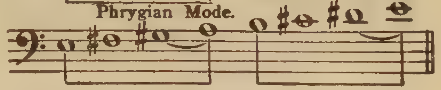
Pythagoras' Octave System.

A was still the keynote or Mese, though no longer the middle or connecting note. Terpander's was called the conjunct system and Pythagoras' the disjunct system. The latter as above printed constituted the Dorian mode, which may be defined as two Dorian tetrachords separated by the diazeuctic tone, embracing the compass of an octave. Terpander's system, not having this compass, cannot strictly be called a mode. Music seems to have developed on both these systems simultaneously in Greece, though finally that of Pythagoras supplanted Terpander's and became universal.

By replacing the two Dorian tetrachords with two Phrygian or two Lydian the modes of the same name were formed.



Phrygian Mode.



Lydian Mode.

These three were the principal modes. Each had two auxiliary modes, one commencing a fourth below and distinguished by the prefix *hypo,* the other commencing a fourth above with the prefix *hyper.* The complete list of the nine original modes is as follows:

I. Dorian.
II. Phrygian.
III. Lydian.
IV. Hypodorian or Æolian.
V. Hypophrygian, or Ionian.
VI. Hypolydian.
VII. Hyperdorian or Mixolydian.
VIII. Hyperphrygian or Locrian.
IX. Hyperlydian.

A convenient way to remember them is to imagine a series of scales, all of natural notes, and an octave in compass, beginning on each of the seven natural notes. It should be remembered that the pitch is entirely relative; each of these modes might begin on the same actual sound. The Mese or Keynote is the fourth note of each scale.

On examination it will be seen that the three Dorian modes are each formed of two Dorian tetrachords, the three Phrygian modes of two Phrygian tetrachords and the three Lydian modes of two Lydian tetrachords. In the three principal modes the diazeuctic tone separates the tetrachords. In the hypo-modes it is the lowest note and in the hyper modes it is the highest note. In all the hypo and hyper modes the tetrachords are conjunct like those of Terpander. It will be seen that two of the hypos

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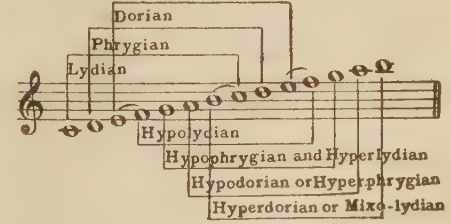
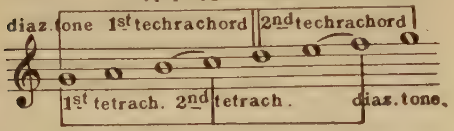

Dorian
Phrygian
Lydian
Hypolydian
Hypophrygian and Hyperlydian
Hypodorian or Hyperphrygian
Hyperdorian or Mixo-lydian

correspond exactly with two hypers, namely, the hypophrygian and the hypodorian are the same as the hyperlydian and the hyperphrygian. It will be observed, however, that the arrangement of the tetrachords and the diazeuctic tone are not the same.

Hypophrygian Mode.



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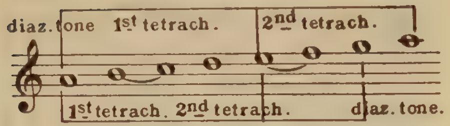
Hyperlydian Mode.

Hypodorian Mode.



Hyperphrygian Mode.

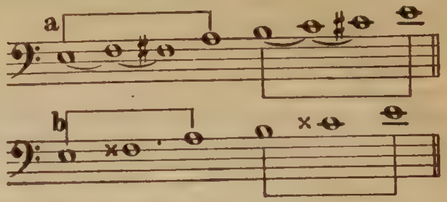
Each mode was said to have its characteristic quality or sentiment; the Dorian seems to have been the favorite one for heroic utterance, while the Lydian was said to be languishing and erotic.

The modes were afterward increased to 15, at least three of which were mere transpositions by octaves of earlier modes. In fact some theorists hold that the later development of the Greek modes completely changed their original significance and that instead of their being different arrangements of whole and half tones in a scale they were all identical in formation and were in fact merely Dorian modes of different pitch. If this is so they should not be called modes at all, but keys, as in modern music. The modern system of equal or even temperament (see Temperament) adopted and developed by Johann Sebastian Bach early in the 18th century and in general use since the middle of the 19th century, would thus appear to have been known to some extent among the ancient Greeks. The titles of the modes seem to contradict this theory, but the subject is so confused and the different theories so difficult of proof that wide differences of opinion will probably always exist. The complete list of the 15 modes is as follows, the pitch given being said to be the accepted one for each mode (or key):

Fourths below	Originals	Fourths above
Hypodorian (A)	Dorian (D)	Hyperdorian or Mixolydian (G)
Hypoionian (B♭)	Ionian or Iastion (E♭)	Hyperionian (A♭)
Hypophrygian (B)	Phrygian (E)	Hyperphrygian or Locrian (A)
Hypoæolian (C)	Æolian (F)	Hyperæolian (B♭)
Hypolydian (C♯)	Lydian (F♯)	Hyperlydian (B♯)

The Greeks had in addition three kinds of chromatic modes and an enharmonic mode. They were all modifications of one or both of the interior tones of the tetrachord, the outer tones of which were never allowed to change their relative pitch. These modes had no significance in the history of music and were not adopted by the Romans.

The following are examples of Pythagoras' original Dorian mode changed to (a) chromatic and (b) enharmonic:

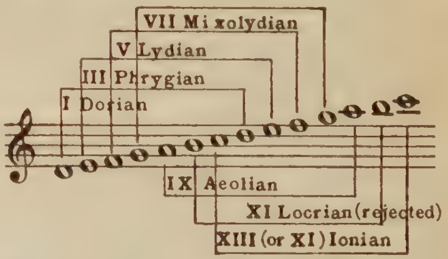


7

The X is used to represent a sound one-quarter of a tone higher than the one preceding it.

The Gregorian or ecclesiastical modes are based on the Greek modes, though many errors and changes of names were made in arranging the system. Saint Ambrose, bishop of Milan, chose four of the ancient modes which he named Authentic. Gregory the Great is said to have added four others called Plagal. Six more were afterward added, making 14, two of which were declared imperfect and rejected. There are two kinds of Gregorian modes, the Authentic and the Plagal. The final or keynote of the authentic modes is the lowest note of its scale. Each authentic mode has an attending plagal mode, a fourth below it, the keynote of which is the same as that of the authentic mode. The plagal modes are therefore similar in this sense to the Greek modes, the fourth notes of which were said to be keynotes. The Gregorian modes are numbered, the authentic receiving the odd and the plagal the even numbers. In addition, the old Greek names are used, the plagal modes receiving the prefix hypo, but unfortunately the Gregorian and Greek titles do not correspond, causing great confusion in all references to the modes. Thus, the Gregorian Hypophrygian is the same as the Greek Hyperdorian and the Gregorian Hypomixolydian with the Greek Phrygian.

As in the Greek modes it is convenient to remember the Gregorian modes by imagining a series of scales, all of natural notes and an octave in compass, beginning on each of the seven notes. These are the authentic modes from which the plagal with their prefix hypo can be readily counted. (It should be remembered that the pitch is entirely relative as in the Greek scales).



8

The Gregorian modes are still in use in the Roman Catholic Church, to the services of which it adds a remarkable effect of antiquity and solemnity.

In modern music but two of the old modes remain; the major, equivalent to the Greek Hypophrygian (or Hyperlydian) and the Gregorian Ionian, and the minor, equivalent to the Greek Dorian and the Gregorian Æolian.

The choice of these two modes took many centuries and must have been made by entirely unconscious perception of their greater value, especially of that of the major scale. A comparison of the major scale with the favorite Dorian mode of the Greeks shows that the modern ear desires the half tone at the top of a tetrachord instead of the bottom, as they did. Whether the favor in which the Dorian tetrachord was held by the Greeks is a proof that they thought their music *downward* and were therefore doing just the same as we do when we think ours *upward* is very doubtful, though a well-known theorist has advanced this clever idea. It is much more likely that the introduction of harmony caused a greatly increased recognition of the true function of the keynote, which, as we understand it, was unknown to the ancients. To us the keynote (in any octave) is the only rest point to the ear; all other notes of the scale trend toward it more or less strongly, and in the instance of an ascending major scale the seventh note (the so-called leading note) demands it more than any other note. This quality of motion and rest led to the greater importance of the major mode over the minor, the seventh note of which, being a whole tone distant from the keynote, lacked the great desire to progress these which is so important a characteristic of the major. Finally, probably by accident at first, the seventh note of the minor was raised so as to be but a half tone below the keynote; this form of the minor key is now known as the «harmonic minor,» and is the only one recognized in harmony.

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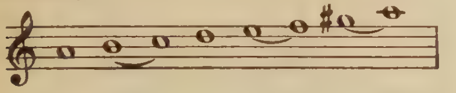
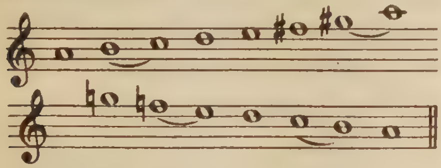


But the distance from the sixth to the seventh being thus made a tone and a half, a very difficult interval to sing or treat melodically, the sixth was raised to secure smoother and easier passage upward and as the double change had made the upper part of the minor mode identical with the major it was argued that neither leading note nor raised sixth was necessary in descending, so both were restored to their original position in descending. This is known as the «melodic minor.»

10



(2) A term used in mediæval music to indicate the relative value of the Large, the Long and the Breve. Two kinds of mode existed, great and less, the first deciding the relation of the large to the long and the second that of the long to the breve. Both kinds could be perfect or imperfect. In great mode perfect the large is equal to three longs. In great mode imperfect it was worth but two longs. In less mode perfect the long was equal to three breves, in less mode imperfect it was equal to two breves. During the end of the 15th century and the beginning of the 16th musicians made extraordinary difficulties in their compositions by means of mode and prolation. See GREEK MUSIC; MEANTONE; DIAZEUTIC TONE; TEMPERAMENT.

GEORGE GORDON THUNDER,
Revised by C. LEONARD STUART, *Editorial Staff of The Americana.*

MODELING. The production of a temporary plastic form to be later executed in permanent condition copying this original, or the forming of a facsimile of an original shape. Modeling can be done in reduced, enlarged or true proportions (*to scale*) according to their purpose. Modeling is usually done in clay, plaster of paris, wax, wood or other plastic material. The sculptor almost invariably makes a model of his creation before treating it in the permanent medium. Gold and silver smiths and jewelers reduce their conceptions to plastic models before going to the expense of evolving the design in the precious metals. The shipbuilder usually works from a reduced facsimile or model of the desired construction. The artist, in producing the effect of relief or solidity in a plane (flat) surface, terms his shading and perspective manipulation «modeling.»

MODENA, mō'dě-nä, Italy, a city and province, part of a former duchy now comprised partly in the compartimenti of Emilia and Tuscany.

The city, capital of the province, pleasantly situated in a fertile plain, between the Secchia and the Panaro, 25 miles northwest of Bologna, is built with great regularity, and has spacious streets and fine promenades on the site of its former ramparts. It consists of three parts — the citadel, the old town and the new town. The most remarkable edifices and establishments are the cathedral, a fine specimen of Romanesque, adorned in front with numerous curious sculptures; the Campanile, erected in 1224–1319, 335 feet high, and one of the finest in North Italy; the church of San Francisco, a handsome Gothic structure, containing a fine terra cotta group of the Descent from the Cross, by Begarelli; several other churches; the ducal palace, begun in the 17th century, but enlarged by numerous modern additions, and forming a splendid structure, now used as a military school; the Albergo Arti or building containing the municipal collections, especially the Estense Library of over 150,000 works, including several thousand MSS., and the picture-gallery embracing a large collection of paintings, several of them by the first masters; the theatre, the baths, the university, several other important educational institutions and charitable endowments. The manufactures consist chiefly of silk goods, silk twist, woolen and hempen cloths, leather and glass; the trade, however, is unimportant. Modena is the see of an archbishop, and possesses various important public offices. It existed under the Etruscans, and as Mutina rose to great splendor under the Romans. It afterward was repeatedly sacked by the northern invaders, whose ravages left few vestiges of its ancient grandeur. Pop. 71,000.

The former duchy bordering on Tuscany, Lucca, Bologna, Mantua and Parma, had an area of 2,573 square miles which in 1901 contained a population of 785,930. It is now divided into the provinces of Modena and Reggio in the compartimento of Emilia, and the province of Massa e Carrara in the compartimento of Tuscany. Modena was made a duchy in 1452, the ruler being Duke Borso of the house of Este, to which noble family Modena had belonged since 1288. In 1796 the French took possession of the country and Modena afterward was included in the Cisalpine Republic. By the Treaty of Vienna in 1815 it was restored to the Este family. The duchy took an important part in the turbulent proceedings of the 19th century, which led to the consolidation of the Italian kingdom in 1860, when Modena proper was formed into a separate province with an area of 1,002 square miles. Pop. about 325,000.

MODERN INSTANCE, A, by Mr. William Dean Howells, was published in 1882. The action takes place in Maine and in Boston, with one scene in Indiana, and the time is fixed by reference to events of the Hayes-Tilden presidential campaign of 1876. The story is one of domestic infelicity, and the tracing out of the gradual coarsening, physical and moral, of the husband, Bartley Hubbard, is a masterly piece of character delineation. The social and business life of a small town and the every-day experiences of a provincial couple embarking on life in Boston are presented with the author's happiest realism, and save the book from gloom or morbidness. Indeed, it is only after the reader has finished with the story, and finds himself impelled to reflect upon it, that he realizes how great a moral tragedy it portrays. 'A Modern Instance' raises more ethical questions than do most of Mr. Howells' novels, but the author is in no sense a propagandist. It may be his disinclination to commit himself on one of these questions that leads him to leave unsettled the fate of two of the chief characters. This indeterminate ending is condemned by those readers who complain that Mr. Howells' novels get nowhere, and the limitations and unheroic qualities of Marcia Hubbard are disapproved by those women who maintain that the author is never fair to their sex; but his kindly, photographic reproduction of the little things of modern life and his insight into social conditions lead those who sympathize with his ideas of fiction to rank this novel among his best.

William B. Cairns.

MODERN LANGUAGE ASSOCIATION OF AMERICA. A society for the advancement of the study of modern languages and their literatures, through the promotion of friendly relations among scholars, the presentation and discussion of papers at meetings and the publication of results of investigations by members. It was incorporated in Baltimore in 1883, and membership is open to all persons on payment of $3 annual dues. For geographical reasons a central association was incorporated in 1903, which holds meetings in the Western States independently of the parent body. A New England branch holds meetings annually. The association issues an annual volume of publications in quarterly instalments. There are about 1,250 members.

MODERN MACCABEES, Knights of the. See Maccabees, The.

MODERN PAINTERS, by John Ruskin (5 vols., 1843, 1846, 1856, 1860), was begun in order to vindicate the landscape painting of J. M. W. Turner against adverse criticism. For this purpose Ruskin set forth systematically and extensively what he conceived to be the æsthetics of visual art — not of landscape painting only, but of painting in general and sculpture as well, with lengthy illustrations from their supposed analogues in literature — the whole in an elaborate a priori analysis of the «Ideas Conveyed by Art» and of the several «Faculties» which produce or appreciate them. Incidental to the defense of Turner, however, come appraisals of other painters, and refutations of critics, which confuse the theoretical treatment; this, as the work goes on, becomes more and more arbitrary, digressive, desultory, and wilful, at the same time that it retires more and more from the reader's attention; until, though formally preserved throughout, it has lost, long before the end, all effectiveness as an organization of the subject.

The key to 'Modern Painters' lies much less in its systematic structure than in its theory — pervasive across all divisions and subdivisions, and persistent throughout Ruskin's 17 years of conscientious modification of opinion by study — concerning the general relation of man and art to nature. The notion that art can improve upon nature seemed to Ruskin presumptuous — a part of the pagan and Renaissance tendency to magnify man and his works. His own faith taught that man is depraved and fallen, and that there is no good in him. Hence Ruskin would minimize man's function in art; he is definitely opposed to human tradition, and is ready, with Wordsworth, to throw away the books and discard the schools. Greatness in art, moreover, commonly assumed to be an effect of human powers, is nothing of the sort; it is a divine gift. «Composition,» «imagination,» «idealization,» and the like — which rearrange actuality to the ends of art — are not achievable by any amount of conscious effort; given humble labor, these things may, perhaps, be added unto it by God; they are a grace vouchsafed to the elect. Such is the evangelical tinge given by Ruskin to the ancient theory of the artist's divine inspiration, and to the modern preoccupation with the functioning of the subconscious. This Calvinism as regards man is supplemented, as regards nature, by that strange «natural religion»— Platonistic rather than Platonic — which so fascinated impulsive hearts in the late 18th and early 19th centuries. Nature, never having fallen, is sinless, pure and perfect; nature is the copy of a divine pattern; let man, then, follow nature; for

> . . . . every prospect pleases,
> And only man is vile.

Marking the belated arrival in art criticism of the naturalistic revolt against the humanistic tradition of the Renaissance, 'Modern Painters' is to the criticism of painting very much what Wordsworth's 'Prefaces' and many of his poems — which Ruskin quotes continually — are to the criticism of poetry.

So understood, it becomes, historically, a document in that romantic anti-humanistic «return to nature» which, for thoughtful persons of the newer generation, was ended by the publication of Darwin's 'Origin of Species' in 1859. We know now that nature is perfectly wasteful and unintelligent, perfectly cruel and unmoral, that her beauties cover up a million festering murders; and that to the human demand for ethical values her answer is silence. Moreover, even could nature be held to be a copy of divine ideas, many modern readers would yet believe, with the Aristotelian æsthetics of classicism and the Renaissance, that art, embodying human concepts of perfection, can shape things actually nearer to their ideal than they ever occur in nature. But Ruskin had grown up in the old «natural religion,» and he never shook it off, though he long survived Darwin's exposure of nature's ways. His books are probably the last great monument to the belief — which Butler, Paley, Wordsworth, Emerson, and the Bridgewater Treatises illustrate in various modes — that nature, being the copy of a divine archetype, is always right; that all her phenomena are intended by God to teach man something; hence, that she is full of symbols, providential adaptations, and final causes, is analogous to morals and religion, exists for man's ethical discipline, and is his monitress and preceptress, ever lessoning him for his good. The worship of nature is with Ruskin literally a part of religion; and he feels that the whole duty of art is to praise God by recording nature's works with the utmost possible fidelity to their supposed ethical ends.

Ruskin's criticism of art thus treats almost exclusively the representation of natural objects — a representation unmodified except upon considerations moral or religious. In the place of æsthetic standards he unblushingly substitutes on the one hand religious or ethical standards, and on the other hand standards which may be called «physical.» In accordance with the first, he looks to art for a didactic content, for assertions or statements as explicit as those of literature; commends this «literary» quality in pictures like Tintoretto's, whose real excellence lies elsewhere; and makes many excursions into the field of poetics and literary criticism: discussing at length, for example, that distinction which had exercised the romantic school of literary critics in the early 19th century — the distinction between *Imagination* and *Fancy;* discussing, again, in a celebrated passage, the «Pathetic Fallacy» of the poets, based as it is upon the assumption that men's moods have a sympathetic analogue and symbol in nature. Again, from Ruskin's assumption that nature is morally perfect arise his impatience of classical and Renaissance attempts to improve upon her by «idealization» or «generalization,» and his inconsistent condemnation of Salvator Rosa and of the Dutch and Flemish realists because when they might have painted to edification, they chose to record «ugly» or «base» things.

In fact, ultimately even the religious and ethical standards fail to modify Ruskin's insistence upon representation; he uses them rather, as in the cases just noted, to confirm his preferences, glorifying as accordant with the divine scheme whatever art appeals to him, and denouncing whatever art does not as tainted with sin. Likewise, though in his theoretical analysis he allows a considerable place to «idealization» and «imagination»— once even speaking of «over-fidelity»— yet practically he is always minimizing their functions and explaining them away. It is with distinct relief, and with a certain unction and fervor, that he always returns to representation pure and simple, detailed and loving and humble, which after all is his religion of art.

This ultimate triumph of the «physical» criterion has several interesting results. Engrossed in representation, Ruskin disregards or contemns abstract design and spatial pattern, and is almost insensible to Oriental art, which so largely depends upon these. Hence his later disparagement of Whistler and of «le Japonisme.» Hence also his commendation of the Pre-Raphaelite movement, whose mediævalist revolt against the Renaissance, and whose love of detailed naturalistic representation («foreground»), coincided with his own, but which he rather reinforced and championed than originated or even decisively influenced. Hence, finally, the net historical effect of ‹Modern Painters› in making for sincerity and humility against the sentimentality, cockiness, prettiness, and *emphase* of contemporary British art.

These evils, thought Ruskin, were traceable, as has been suggested, to the Post-Raphaelites of the Renaissance tradition, with their supposed tricks and insincerities and «rules of composition» and «practice of the schools.» He must clear all that away, old masters and all — especially the Bolognese eclectics, and Claude, Poussin, and Hobbema — and establish in their place nature and Turner. The underlying assumptions of his method have been shown; its most important and most bulky actual product remains to be mentioned: the remarkable collection of observations of natural phenomena which Ruskin adduces to illustrate Turner's rich and various fidelity to nature. Large portions of the first, third, fourth, and fifth volumes, are given to description, in word and in picture, of nature's endless phases — the effects of wind and mist, the structure of rocks and the radiation of light, the organization and appearance of mountains, of clouds, of tree-trunks, boughs, and leaves, of waves and foam and reflections in water.

The reader who is interested in ‹Modern Painters› for its place in Ruskin's life or for its own evolution in time as a piece of writing will of course read it as it was written; but if he approach it for pleasure he will be well advised to begin with the third volume. The first two volumes, to be sure, contain some of its most gorgeous passages — like the celebrated word-pictures of Aricia and of Turner's ‹Slave-Ship.› Yet these, after all, are purple patches; and the body of the text is undistinguished, or distinguished chiefly by a crude parallel structure in couplets — a parallelism often both forced in thought and actually bungled in execution. Ruskin's early fondness for inordinately long sentences, again here, too often leads him to jumble into a single perfervid period the material that should have formed a paragraph: instead of ordering it from sentence to sentence into separate articulated stages of thought, he pours it all volubly out into one heavy lump of a sentence loosely glued together by *and, but, for, only, as, so* and *so that.*

But in the 10 years between the publication of the second and the publication of the third and the fourth volumes Ruskin's style underwent a sobering and clarifying change. He had had much practice in writing — had meanwhile published ‹Seven Lamps of Architecture› (1849), ‹The Stones of Venice› (1851–53), ‹Pre-Raphaelitism› (1851), and ‹Lectures on

Architecture and Painting’ (1854); and his ideas having gained acceptance, he now spoke with more of authority and plainness, and less of the hot rhetoric of controversy. Here also he virtually abandoned the dreary scholasticism of the æsthetic system he had so aridly set forth in the second volume. The reader, then, who plunges *in medias res* is more likely to reach at once the heart of ‘Modern Painters.’ He will feel at once the essential nobility of a book which, often wilful and mistaken, is never mean and is often tonic. He will realize it as the outcome of many years’ disinterested study both of nature and of painting, as a whole-hearted appreciation of Turner, who would be great upon any theory however arid, and as a valuable collection of natural facts and appearances, recorded by a loving observer, indefatigable students, and exquisite draughtsman, whose wilfulness vanishes when he is face to face with nature. Here lie its real strength and lasting value: it will probably stand as a great apprecation of a very great painter and, as a veritable treasury of things observed.

Samuel Lee Wolff.

MODERN SCHOOLS OF DRAMA. See School of Drama, Modern.

MODERN WOODMEN OF AMERICA. See Woodmen of America, Modern.

MODERNISM, the designation applied to the advanced opinion of publicists and lecturers which in recent times were at variance with traditional orthodox doctrines. Official restraint was laid on them when Pope Pius X during his pontificate (1903–14) enunciated the following doctrines in his famous encyclical «Pascendi gregis» issued in 1907. Dealing with the «modernist» movement and propaganda, and, speaking of it he laid down the following conditions and regulations, which he ordered Catholics to follow. He said in part:

«In the first place, as regard to studies, we shall not ordain that scholastic philosophy be made the basis of the sacred sciences. It goes without saying that if anything is met with among the scholastic doctors which may be regarded as an excess of subtlety, or too carelessly stated; if there is anything which does not square with later discoveries, or which is altogether destitute of probability, we have no desire whatever to propose it for the imitation of present generations. And let it be clearly understood above all things that the scholastic philosophy we prescribe is that which the angelic doctor has bequeathed to us. . . . In the vast and varied abundance of studies opening before the mind desirous of truth, everybody knows how the old maxim describes theology as so far in front of all others that every science and art should serve it and be to it as handmaidens. . . . Anyone who in any way is found to be imbued with modernism is to be excluded without compunction from these offices, and those who already occupy them are to be removed. . . . Equal diligence and severity are to be used in examining and selecting candidates for holy orders. . . . It is also the duty of the bishops to prevent writings infected with modernism, or favorable to it, from being read when they have been published, and to hinder their publication when they have not. No book or paper or periodical of this kind must ever be permitted to seminarists or university students. . . . The Holy See neglects no means to put down writings of this kind, but the number of them has now grown to such an extent that it is impossible to censure them all. . . . It is forbidden to secular priests, without the previous consent of the ordinary, to undertake the direction of papers or periodicals. . . . Let priests hold as sacred the authority of their prelates, let them take it for certain that the sacerdotal ministry, if not exercised under the guidance of the bishops, can never be either holy, or very fruitful or without blemish. . . . It is impossible to approve in Catholic publications of a style inspired by unsound novelty which seems to deride the piety of the faithful and dwells on the introduction of a new order of Christian life, on new ordinances of the Church, on new aspirations of the modern soul, on a new vocation of the clergy, on a new Christian civilization. . . . Ancient relics are to retain the veneration they have always enjoyed, except in those individual instances when there are clear arguments that they are false.» Consult Marchesan, A., ‘The Programme of Modernism: Reply to Encyclical of Pius X’ (New York 1908).

MODESTO, Cal., city, county-seat of Stanislaus County, on the Tuolumne River, and on the Southern Pacific Railroad, about 80 miles south by east of Sacramento. It is in a productive agricultural region, the system of irrigation contributing greatly to its prosperity. The trade consists chiefly of wool, grain, fruit and truck. The prominent buildings are the county courthouse, county hospital and churches. Pop. (1920) 9,241.

MODICA, mō'dē-kạ, Italy, capital city of the province of Syracuse, Sicily, located between rocky declivities, on the Syracuse-Licata Railway and 33 miles distant from Syracuse city. It contains a beautiful 17th century church, an ancient castle on the heights, a monastery with 15th century ruins of a church, a lyceum and gymnasium, seminary, technical school and institute. Its chief industries are cattle-raising, cultivation of southern fruits and trade in agricultural products. Its population in 1911 was 55,924.

MODJESKA, mŏd-jĕs'ka, **Helena,** Polish actress: b. Cracow, 12 Oct. 1844; d. Bay City, Cal., 8 April 1909. Her father was a musician. In 1860, having married a theatrical manager, Modrzejewski, whose name she has since softened to Modjeska, she began to act, and soon gained local fame. After her husband’s death she appeared in Warsaw in 1868, after marrying Count Bozenta Chlapowski in September of that year. In 1876 she came with the latter to America. In July 1877, at San Francisco, she made her American début as Adrienne Lecouvreur in an English version of the play by Scribe and Legouve. Three years later she was seen in London as Camille, and from that time she was one of the foremost actresses of the English-speaking tragic stage. She starred with Booth in 1889–90. Her best rôles were Shakespearean, notably Lady Macbeth, Cleopatra, Ophelia and Viola. Consult ‘Helena Modjeska: Memories and Impressions’ (New York 1910).

MODJESKI, Ralph, American civil engineer: b. Cracow, Poland, 27 Jan. 1861. He came to the United States with his mother in 1876 and, for American naturalization, he changed his name to Modjeski, his mother being the celebrated tragedienne, Helena Modjeska. He was graduated at the College des Ponts et Chaussées, Paris, at the head of the class and with honors. He has designed and built many bridges in the United States, the largest among them being the government bridge at Rock Island over the Mississippi; the Mississippi River bridge at Thebes, Ill.; the McKinley bridge at Saint Louis; the new Bismarck bridge over the Missouri; bridges over the Columbia River at Vancouver, Wash., and Celilo, Ore.; two bridges over the Willamette River at Portland, Ore. He has recently constructed two bridges over the Mississippi River, — one at Memphis, Tenn., and one at Keokuk, Iowa, and is also consulting engineer on the design and construction of the Ohio River bridge at Metropolis, Ill., for the Chicago, Burlington and Quincy Railroad and of the Thames River Bridge at New Haven, Conn., for the New York, New Haven and Hartford Railroad. He was one of the three members of the commission on the Quebec bridge, which has the longest span in the world. He received an honorary degree of doctor of engineering at the University of Illinois in 1911; is a past director and member of the American Society of Civil Engineers; member of the British Institute of Civil Engineers and of the American Institute of Consulting Engineers; past president and member of the Western Society of Civil Engineers; member of the Franklin Institute and of the American Railway Engineering Association; also member of numerous engineers' and social clubs.

MÖDLING, méd'ling, Austria, a town located at the foot of the Wienerwald, Lower Austria, to the south of Vienna, on the Mödling stream, and junction of two railways. On account of the cool summers it is a favored summer resort and has three Catholic churches, among them the Early Gothic Saint-Othmar Church, dating from 1454, with its Romanesque baptistry, a Protestant church, town-hall, city park with theatre and Kurhaus, a military academy, high school and Obergymnasium, agricultural school with curricula in brewing, horticulture, etc.; also an orphan asylum with its church, chalybeate baths, sanatorium, etc. Its chief industries are wine growing, manufactures of iron and metal wares, tubular boilers, sash and door works, varnish and lacquer works. Pop. about 18,067.

MODOC (mō'dŏk) **INDIANS,** a tribe of northern California, which in 1872, after firing on the United States forces, retreated to the neighboring lava beds, and there defended themselves desperately till June 1873, murdering two peace commissioners sent to them and killing or wounding 132 of the troops. Their chief, Kintupash, commonly known as Captain Jack, and three others, were hanged in October; about 100 who had not followed him were permitted to remain in California, the rest (145) were transferred to Indian Territory. The Modocs originally made their home on the shores of Lost River and Klamath Lake. They called themselves the *Maklaks,* or «the people.» They were always a warlike tribe, and when not fighting immigrants and settlers in the early days were warring with other tribes in their neighborhood. Of the surviving Modocs, about 200 reside at the Klamath Reservation in Oregon.

MODULATION, *in music,* the act of moving through the sounds in the harmony of any particular key to those of another, or the transition from one key to another. The simplest form is the change from a given key to one nearly related to it, namely, its fifth (dominant), fourth (subdominant), its relative minor, or the relative minor of its fifth. Modulation into the dominant is effected by introducing in any of the parts (rarely in the bass, however) the sharp fourth, which becomes the seventh of the new key; thus, in the key of C, F would be sharpened to effect the transition into the key of G; to pass from that key into that of D it would be necessary to sharpen the C, and so on. In modulating into the subdominant the flat seventh is used, which becomes the fourth of the new key; thus, in passing from the key of C to that of F, the flat B is introduced, and from the key of F to that of B the E is flattened, and so on. The modulation into the relative minor is generally effected by employing the sharp fifth, which becomes the seventh or leading note of the new key; thus in changing from C to A minor the G should be sharpened. As almost every piece ends on the key in which it begins, a second modulation becomes necessary; this is effected by flattening the fifth of the new key if the first modulation is into the dominant and sharpening the fourth if in the subdominant. When a composer aims at a striking effect he may change from some given key to one quite unrelated, from C to E for instance; but such transitions should be sparingly employed. Modulation is generally resorted to in long compositions to please the ear with a fresh succession of chords. (See also MODE; MUSIC; TEMPERAMENT). Consult Groves, ‹Dictionary of Music and Musicians› (Vol. III, pp. 232–240, New York 1910).

MODULE, from the Latin *modulus,* a small measure. A term used in architecture to designate an arbitrary unit of measurement on which to base the proportions of an order or the entire edifice. Architects have usually accepted either the diameter or half-diameter of a column at the base of a shaft as a unit or module for the order. This unit they divide into a graduated scale in minutes or parts according to individual selection. Vignola took a semi-diameter as his module and divided it into 12 parts for the Tuscan and Doric and into 18 for the other orders. Talladio, Cambria, Desgodetz, Le Clerc and others accepted a module in 30 divisions or minutes for all orders. Others have taken the entire height of the column and divided it into 20 parts for the Doric, 22½ for the Ionic, 25 for the Corinthian, and so on, one of which is taken for the module by which to regulate the other parts. Perrault's module was a third part of the diameter of shaft at base, to avoid a fraction. See ORDERS OF ARCHITECTURE.

MODULUS, *in mathematics,* a constant referring to properties of matter in certain equations. As stress is proportional to strain within the elastic limits, some constant quantity may be introduced, making this proportionality into an equality. In dealing with strength of materials, such a constant is called a modulus. Thus in Hooke's law, which says that extension, as of a bar, is proportional to the extending force, the constant which converts this proportionality into an equality is called the modulus of elasticity, or Young's modulus, and is denoted by E. Where the elastic limits are not exceeded, the transverse strain — i.e., the contraction per unit of transverse dimension — is from one-third to one-fourth the longitudinal strain. The symbol denoting the modulus of elasticity of bulk is K. It denotes the lessening of bulk per unit cube, usually per cubic inch, under hydrostatic stress. See ELASTICITY.

MOE, mō, **Jörgen Ingebretsen,** Norwegian folklorist and poet: b. Ringerike, 22 April 1815; d. Christiansund, 27 April 1882. He is most noted for collecting, in collaboration with his companion Asbjörnsen, Norwegian sagas and folklore published under the titles 'Norske Folkeaeventyr' (1842–44; enlarged ed., 1882), in an English version by Dasent (1859); 'Samling af Sange, Folkeviser og Stev' (1840; enlarged ed., 1869, with melodies by Lindeman). His 'I Brönden og Kjaernet' (1851) containing juvenile stories and sermons are greatly admired, based, as they are, on folk poems. 'Samlede Skrifter' (Christiania 1877) is a collection of his works excepting the folk stories. Consult Halvorsen, J. B., 'Norsk Forfatter-Lexikon' (Vol. IV, Christiania 1896).

MOEBIUS, me'bē-oos, **August Ferdinand,** German astronomer: b. Schulpforta, Germany, 17 Nov. 1790; d. Leipzig, 26 Sept. 1868. He was graduated from the University of Leipzig in 1815, and was for 50 years professor of astronomy there. Through his efforts the observatory was remodeled and by his writings he established a new principle concerning the affinities of figures and proved the close connection between statics and geometry. He published 'Der Barycentrische Calcul' (1827); 'Lehrbuch der Statik' (1837); 'Die Elemente der Mechanik des Himmels' (1843); 'Haupsätze der Astronomie' (4th ed., Leipzig 1853), etc.

MOELLER, mĕl'ler, **Henry,** American Roman Catholic prelate: b. Cincinnati, Ohio, 11 Dec. 1849. His elementary studies were pursued at Saint Joseph's parochial school and he afterward attended Saint Xavier's College. In 1869 he went to the American College, Rome, where he followed a seven years' course in philosophy and theology. He was ordained priest in the church of Saint John Lateran, Rome, 10 June 1876, and after his return to Cincinnati was made pastor of Bellefontaine and later appointed to a professorship in Mount Saint Mary's Seminary, remaining there till 1879. In 1880 Archbishop Elder named him chancellor of the diocese of Cincinnati, and on 25 Aug. 1900 he was consecrated bishop of Columbus, Ohio. In April 1903 the Holy See appointed him titular archbishop of Areopolis and Coadjutor Archbishop of Cincinnati with right of succession, and on the death of Archbishop Elder, 31 Oct. 1904, he assumed charge of the archdiocese, the pallium being conferred upon him 15 Feb. 1905.

MOELLER, Louis, American genre painter: b. New York, 5 Aug. 1855. He worked with his father, a decorator, for four years; studied in Munich with Dietz and Duveneck; and in 1883 returned to New York. He became a member of the National Academy in 1895, and has exhibited there since 1883. Among his works are 'Road to School' (1883); 'Puzzled' (1884); 'Short Measure' (1885); 'An Interior' (1886), etc.

MŒRIS, mē'rĭs, Egypt, an ancient artificial lake north of Medinet-el-Fayum, until recent years confounded with Birket-el-Keroon (q.v.) — lake of the horn — with which it was connected. According to Herodotus, Lake Mœris was 350 miles in circumference, and about 300 feet deep. He states it to have been entirely the product of human industry. Birket-el-Keroon, about 30 or 40 miles long and six broad, is a natural basin. The works, therefore, which Herodotus attributes to King Mœris (Amenemhat III) are the Bahr Jusuf (Canal of Joseph), which connected Mœris with the Nile, and the canal connecting with the Birket-el-Keroon. The fisheries of the lake were very productive. The revenue derived from them went to the Egyptian queens. The two colossal statues described by Herodotus were discovered at the end of the 19th century, at Biahmu, the site of Crocodilopolis, an ancient neolithic town on the lake near the Bahr Jusuf entrance.

MŒRITHERIUM, a large amphibious animal of primitive proboscidian character, whose remains are found in the Eocene rocks of Egypt, about the shores of Lake Mœris in the Fayoum. It is of special interest as the earliest known progenitor of the elephants, and it also has many anatomical resemblances to the sirenians or sea-cows.

MŒSIA, mē'shĭ-ạ, a province of the ancient Roman Empire lying north of Thrace and Macedonia, and south of the Danube, corresponding to modern Serbia and Bulgaria. Its original inhabitants were, according to Strabo, a tribe of Thracians. In 227 B.C. a large body of Gaulish invaders entered Mœsia after the death of their leader, Brennus, and settled there under the name of Scordisci. The Romans first invaded it in 75 B.C., penetrating as far as the Danube. It was not, however, until 29 B.C. that it was finally subjugated. The Visigoths (Mœsogoths) settled here in the 4th century, and it was afterward conquered by the Slavonians and Bulgarians.

MOFFAT, David Halliday, American capitalist: b. Washingtonville, N. Y., 22 July 1839; d. 1911. He started life as a messenger for the New York National Exchange Bank (1854), became bank clerk (1855) at A. J. Stevens and Company, Des Moines, Iowa, then cashier at a bank in Omaha, Neb. In 1860 he joined the gold pilgrims for Pike's Peak but started a stationery business, in partnership with C. C. Woolworth of New York, at Denver. After six prosperous years he accepted the position of cashier at the First National Bank, Denver, becoming its president and staying in that capacity till his death. He was closely identified with the building of several railroads and was president of the Rio Grande Railroad from 1884 till 1891. His mining interests in Colorado were among the largest in the State.

MOFFAT, mŏf′ạt, **Robert,** Scottish missionary to South Africa: b. Ormiston, East Lothian, 21 Dec. 1795; d. Leigh, near Tunbridge, 8 Aug. 1883. He obtained an ordinary education; became a gardener; and about 1813, being deeply moved by the story of some Methodist missionaries, decided to go to Africa, whither he was sent in 1816 by the London Missionary Society. His first work was in Namaqualand, where he made a convert of Afrikaner, a Hottentot robber; later he settled among the Bechuanas in Kuruman, where his wife, daughter of his former employer, who married him in 1819, joined him and helped him greatly. He resided in England from 1839–42. His book, ‹Missionary Labours and Scenes in Southern Africa› (1842), stimulated interest in the Dark Continent. Moffat, with the assistance of several other missionaries, translated parts and finally all of the Bible (1872) into the language of Bechuanaland. He returned to England in 1870, where his wife died in the following year, and he spent the last years of his life in rousing interest in South African missions. One of his daughters married Dr. Livingstone (q.v.), the missionary and explorer. He was the staunch friend of the native races. Consult ‹The Lives of Robert and Mary Moffat,› by John S. Moffat, their son (1885).

MOFFAT, William David, American publisher and author: b. Princeton, N. J., 17 Jan. 1866. He was graduated from Princeton University in 1884 and entered the publishing business. In 1897 he became business manager of *The Book Buyer* and of *Scribner's Magazine.* In 1905 he became president of the publishing firm of Moffat, Yard and Company. He has written ‹The County Pennant›; ‹Brad Mattoon›; ‹Not Without Honor,› etc.

MOFFETT, Cleveland Langston, American author and journalist: b. Boonville, N. Y., 27 April 1863. He was a member of the New York *Herald* staff in Europe (1887–91), then in New York (1891–92), becoming foreign editor of the New York *Record* (1893–94). From 1908 to 1909 he was Sunday editor of the New York *Herald,* but then became contributor to the magazines. He wrote ‹Real Detective Stories› (1898); ‹Careers of Danger and Daring› (1901); ‹A King in Rags› (1907); ‹The Battle› (1909); ‹The Bishop's Purse› (1913); ‹The Mysterious Card› (1913); ‹The War Beautiful› (1917). Of his prose poems may be mentioned ‹A Woman's Breed›; ‹The Litany of Men›; ‹A Vision of Christmas› (1917). Among his plays are ‹Money Talks› (produced 1906); ‹Playing the Game› (produced 1907); ‹The Battle› (1908); ‹For Better or Worse› (1910); ‹Greater than the Law› (1912). He translated ‹Cosmopolis› by Paul Bourget (1894).

MOGADOR, mŏg-ạ-dōr, Africa, a seaport town in Morocco, known to the Moors as Suera, the beautiful, and by the Berbers as Tassart. It is located on the Atlantic Coast on a projecting cliff and separated from the mainland by a region of dunes. It is strongly fortified by walls mounting cannon, with towers and bastions. It has wide, clean streets bordered by high houses, also an aqueduct. The town consists of the Kasbah or citadel and the outer town with its Jews' quarter (Mellah). The industries are restricted to Morocco leather, tanneries and the making of beaten copper utensils, but there is considerable trading in such imports as cotton goods, sugar, tea, hardware and in exports of goats, oxen, sheep skins, almonds, beeswax, olive oil, rubber, etc. Most of the trade is with Great Britain and France. The population is about 22,000, over half of whom are Jews.

MOGOLLON (mōg-y′ŏn) **MOUNTAINS,** a range in southwestern part of Socorro County, N. Mex., constituting the divide between the San Francisco and Gila rivers. It is over 30 miles long and the highest summit, Mogollon Peak, is 10,778 feet above sea-level. The range consists of a thick succession of Tertiary volcanic rocks with veins of silver and other ores mined near Cooney and Mogollon. It is largely forested and has been included in Gila National Forest.

MOGOLLON PLATEAU, the southern edge of the high plateau of Arizona extending from eastern Yavapai County to Apache County. Limestone in part covered by lava and averaging about 6,000 feet in altitude. It bears considerable pine forest and is included in Coconino and Sitgreaves National forests.

MOGUL, mō-gŭl′, the same as Mongol, applied particularly to the sovereigns of Mongolian origin, called Great or Grand Moguls, descendants of Tamerlane, who ruled in India from 1526 to 1765, when the consolidation of British power in the peninsula reduced them to a position of tutelage. The last emperor joined the rebels during the Indian Mutiny in 1857, and died a prisoner in Rangoon in 1862.

MOHÁCS, mō′häch, Hungary, grand commune in the county of Baranya, on the Danube opposite the large Margaret Island. It is important on account of its steamboat and railroad lines, and has a castle, five churches and a monument to King Ludwig II. Considerable trade is done in wood and grain and it has among its manufactures silk factories, electric works, tile works, etc. It is noted on account of the battle between Ludwig II and the Turks under Sultan Soliman II which was lost (29 Aug. 1526) together with the lives of 24,000 Hungarians, the king and the liberty of most of Hungary. On the 12 Aug. 1687 Duke Karl of Lorraine and Margrave Ludwig of Baden fought a bloody battle near here which cost the Turks 16,000 men and hastened the end of Turkish rule over Hungary. In 1910 it had a population of 17,092. Consult Kupelwieser, L., ‹Die Kämpfe Ungarns mit den Osmanen bis zur Schlacht bei Mohacs 1526› (Vienna 1895).

MOHAIR. Mohair is the commercial and technical name of the fleece of the Angora goat. The word comes to the English through the Old French *mohere,* from the Arabic *mukhayyar,* meaning mohair cloth. In color mohair is pure white, except in rare cases, and grows in ringlets. The hairs composing a fleece are of varying lengths, but the average annual growth of the long hairs, which largely predominate, is about 10 inches. The hairs are not composed of epithelia, as is the case with wool, and therefore the felting property characteristic of wool is wanting. In fineness mohair is variable with the individual animals, and is placed between the fine and coarse wools; in lustre, durability and strength it has no equal among fibres.

The only vitiating feature of mohair as it comes from the animal is the intermixture of an undercoat of lustreless, chalky-white hairs which vary in length from one to three inches, and vary in total amount according to the breeding of the animal. This undercoat is known technically as «kemp,» and the principal objection to it is that it does not take the fast dyes. It becomes necessary, therefore, to remove the kemp from the mohair used in the finest fabrics, and this work is done by a comb which, in removing the kemp, also takes out every mohair fibre of equal length or shorter than the kemp. This entails a loss ranging from 10 to 30 per cent, but the average is becoming smaller as better goats are developed.

The lustre of mohair is very pronounced, and no amount of washing, dyeing or other manipulation will dull it. Its durability is remarkable, and because of this fact it enters largely into goods of fine quality but which are subjected to hard usage, such as railway plush. Fast dyes have such an affinity for it that sunshine and storms have no effect on its brilliancy.

The uses of mohair are multifarious, and are capable of wider expansion as the supply of mohair becomes larger. Its largest use is in the manufacture of plush. Practically all of the railway plush of the world is made of mohair, and also large quantities of furniture plushes of varying qualities and numerous designs. It enters into brilliantine, zibeline and crepen dress goods, coat linings, so-called alpaca goods, imitation Astrakhan for capes, coats and muffs, and many other fabrics under trade names which do not show what the goods are.

There are about three countries producing mohair in appreciable quantities as yet: Turkey in Asia, with 10,000,000 pounds annually; South Africa, with 15,000,000 pounds annually; and the United States, with 2,000,000 pounds annually. (These figures are approximated). The prices ruling in the United States in ordinary times are from 25 to 45 cents per pound. In New England and New York there are mills which consume all of the American product, besides importing large quantities of Turkish and South African hair from Bradford, England.

MOHAIR GOAT, the Angora goat. See GOAT.

MOHAMMED («The Praised One»; also written: Mahomet; Muhammad, the Arabic form; Mahmoud; Mehemet, etc.), Prophet and founder of Islamism, general called by Christians Mohammedanism (but not by the followers of the faith of Islam): b. Mecca, Arabia, probably in April 569 A.D. (according to some authorities 570 and 571 A.D.); d. Medina, Arabia, 7 June 632 A.D. Mohammed was not born in a lowly state as we might be led to believe by some of the tales of his early life. On the contrary his progenitor, Hashim, of the illustrious tribe of Koreish, was the great benefactor of Mecca and the guardian of the Caaba, an honor never conferred except upon those belonging to the most honorable tribes and families. Abdul-Muttalib, his son, succeeded to these honors, and the guardianship of the Caaba was confirmed in the line of Hashim by his action in saving the sacred city from the onslaughts of the Christians of Abyssinia. Abdul-Muttalib had many children and Abdallah was the youngest and most beloved. He was remarkable for personal beauty and possessed the secret of winning the hearts of women. He married Amina, of the tribe of Koreish, and on the night of the wedding, we are told, 200 maidens died of broken hearts.

Mohammed was the only fruit of this marriage, and his father died two months after, leaving no other inheritance than five camels, a few sheep and a female slave. It is difficult to reconcile this fact with his former exalted position, but we are assured that it is true, as we are also asked to believe the statement that Amina suffered none of the pains of childbirth, and that Mohammed, on the moment of coming into the world, raised his eyes to heaven and exclaimed, «God is great! There is no god but God, and I am his prophet.» Legend also tells us that signs and portents took place at the moment of Mohammed's birth. Lake Sawa dried up, and the sacred fire of Zoroaster which the Magi had kept burning uninterruptedly for over a thousand years was suddenly extinguished, and all idols fell down. The massive palace of Khosrau, king of Persia, shook to its foundations and several of its towers were thrown to earth.

When Abdallah died, Amina's grief was so great that it dried up her breasts, and she was forced to look for a nurse among the females of the Bedouin tribes. At length Halima, the wife of a Saädite shepherd, took him into the mountains and nursed him, but returned him to his mother at the end of two years because he had epileptic fits. His mother died when he was six years old, and his grandfather, Abdul-Muttalib, adopted him. On Abdul's death, an uncle, Abu Talib, took the lad and remained his closest companion and devoted protector throughout his life. He was a merchant and brought Mohammed up in the same line. On one of his trips to Syria he visited a Nestorian monastery and there imbibed many ideas. Even in his youth he carried religious contemplation to an extreme, and it is believed that his epilepsy had much to do with this morbid tendency. Wonderful mental faculties are ascribed to him but he was just as illiterate as most of his countrymen. When 25 years old he was employed by a rich widow, Kadijah, also of the tribe of Koreish. He displayed such good judgment and business qualities in caring for her caravans and other commercial interests that, in spite of the fact that she was already twice widowed, she married him. She was 15 years older than Mohammed, but bore him two sons and four daughters. Al-Kasim and Abd Allah, the two sons, who were respectively the oldest and the youngest of his children, both died in early youth; the four daughters survived — Fatima, Zainab, Rukaiya and Umm Kulthum. He lived with his wife in faithful and happy wedlock till her death.

With his marriage Mohammed acquired great wealth, and this gave him leisure to indulge the original bias of his mind; his old habits of contemplation were revived. His judgment and probity were widely respected. There was a steady growth in his zeal to abolish idolatry and other evils, and to substitute a new and purer faith. This was fostered by his intercourse with Jews and Christians whom he was forced to meet in his journeyings. The idea of a new religion finally engrossed his whole mind and influenced his every action. He believed he saw the necessity for it; all sorts of new dogmas were creeping into and rapidly undermining the faith of his forefathers. During the first centuries of the Christian propaganda religious doctrines were more numerous than the stars in the sky; both Christianity and Judaism had crept into Arabia, Zoroastrianism was on the wane and people refused any longer to accept and conform to the old pagan superstitions. Othman, Zaid and even Waraka, one of his wife's relatives, who had embraced Judaism, were preaching against the futility of star-worship, and their followers were ridiculing fetishes, ceremonies and even the temples. Many were being exhorted to Judaism while others were embracing Christianity, and others still were falling away altogether. Everyone was looking for a religion which should embody the faith of their forefathers with the simple doctrine of the unity of the Deity. Something had to be done — the time was ripe, and Mohammed launched the faith of Islam. He went back to the beginning of things, and adopted as a hypothesis that God had inculcated in Adam the one and only true religion — the worship of one indivisible and only God, the Creator. He believed that this religion of Adam had been repeatedly debased, and almost forgotten at times, but that a succession of prophets was destined to come into the world to restore it from time to time and bring men's minds back to the original idea — such prophets were Noah, Abraham, Moses and Jesus Christ. These had all fulfilled their respective missions, but man now needed another guide. It is not to be wondered at that Mohammed looked especially to Abraham, the father of Ishmael, the progenitor of his own race, as one of the greatest of these. With the development of this idea of the oneness of God grew Mohammed's mission as he conceived it. We can scarcely doubt that he was honest in his convictions and in his purpose when he first undertook the reformation of the world, which he really began at the age of 40 years.

Mohammed's first convert was his wife, Kadijah, to whom he told the particulars of an interview which he claimed to have had in a vision with the angel Gabriel, who declared him to be the apostle of God. He was passing, as was his custom, the month of Ramadan in the cave of Mount Hara after fasting, prayer and meditation, when the angel Gabriel appeared to him, displaying a silken cloth covered with writing. «Read!» said the angel. «I know not how to read!» replied Mohammed. «Read,» repeated the angel; and immediately he was illumined with celestial light and understanding, and read what was written upon the cloth, which contained the decrees of God as afterward promulgated in the Koran. Through his wife, her uncle, Waraka, was won back from Christianity and became serviceable to Mohammed on account of his great knowledge of the Old and New Testaments. The next to be converted were the fiery Ali, his nephew, and Zaid, his faithful servant; also Abu Bekr, a man of high position, at whose solicitation 10 of the best citizens of Mecca joined the faith. Mohammed confided his revelations only to members of his household for a time, and was laughed at by some and reproached by others — Abu Lahah, an uncle, called him a fool, and Abu Talib, his adoptive father, while always protecting him, never actually confessed belief in his works. Mohammed personally instructed all his early converts in the doctrines of the new faith of Islam. After four years Mohammed's converts numbered but 40, and they were obliged to hold their meetings in secret in a cave near Mecca. Even here they were discovered and attacked by a rabble. Mohammed had much to contend with in these early days; many members of his tribe were against him, and Abu Lahib, his uncle, a rich and influential man, openly opposed what he called Mohammed's heresy.

In answer to a vision Mohammed now began to preach publicly, and summoned all the Koreishites of the line of Hashim to meet him on the hill of Safa. Scarcely had he begun his discourse when Abu Lazib attempted to hurl a stone at him. Mohammed turned, cursing the hand thus raised against him and predicting his doom, with the further assurance that his wife, Omm Jemil, would help build his death-fire. Mohammed soon called another meeting and this time boldly announced his divine command to impart his revelations received from heaven. At this meeting he called for a vizier or vicegerent; Ali was selected as he alone volunteered. He soon found a following among the people at large, threw off all reserve, proclaiming himself a prophet sent by God to put an end to idolatry. His favorite places of preaching were the sanctified hills of Safa and Kubeis; Mount Hara was his Sinai, whither he retired for contemplation and fresh revelations. He was often attacked with open force by his enemies, and in the 10th year of his prophetic office was deprived by death of his faithful wife, Kadijah, and Abu Talib. He then retired to the city of Taif but kept gaining numerous followers, among others many inhabitants of Medina. About this time occurred his famous vision in which he claimed to have made a nocturnal journey to heaven on the beast Al Borak, as referred to in the Koran. Shortly after, a conspiracy to murder him was set on foot, and he was obliged to flee to Medina. This took place in 622 A.D., and is known as the Hegira («flight») and marks the beginning of the Mohammedan era.

Mohammed was accorded a warm reception in Medina. He organized his followers and provided set forms of worship and religious observances; he proselytized the Jews and other sects in the neighborhood and made many concessions to draw them to the new faith. As a result he was made judge and then ruler of Medina, and boldly assumed regal authority and dignity. After marrying Ayesha, the daughter of Abu Bekr, he announced his determination to take up the sword in furtherance of his doctrines. The hope of plunder thus held out brought him hordes of followers. His first expedition attacked a Koreishite caravan led by Abu Sofian, and rich booty was secured and divided. But Abu Sofian returned shortly with 3,000 soldiers and utterly routed Mohammed who had but 1,000. Mohammed, badly wounded, managed to escape. He rallied his troops, however, and gained new followers, by seductive promises, explaining that the defeat was due to the sins of his adherents. In 627 Abu Sofian again brought an expedition against him and laid siege to Medina with a force of 10,000 men. After 20 days, however, his forces broke and dispersed on account of internal discord. Mohammed then led his army against the Jews who had sided with the Koreishites, and took a bloody revenge. Over 700 men were massacred, and the women and children were carried into slavery. From this time on Mohammed's thirst for warfare and blood seemed to be insatiable. His whole nature apparently underwent a change. He introduced a special chapter in the Koran to give himself permission to marry Zainab, the wife of his former slave Zaid. He followed this from time to time with numerous other marriages and amours and multiplied them to such an extent that at the time of his death he had no less than nine wives. All these affairs he explained by his divine mission, although diametrically opposed to his own laws as set forth in the Koran. His ambition and his views continued to expand with numerous successes in warfare and the tremendous growth in the number of his converts. He gradually conquered all the small surrounding tribes of Arabia; and then becoming still more ambitious and arrogant, sent deputations as missionaries beyond the frontiers. He sent to Khosrau Parviz, king of Persia; Heraclius, emperor of Constantinople; Mokawkas, ruler of Egypt; the king of Ethiopia, and the princes of various districts of Arabia, to embrace the new revelation of the divine law made through him. The stronger and more remote principalities rebelled, but the weaker at once adopted the faith of Islam. The king of Persia and Amru, the Ghassamide, rebelled, and Amru had the ambassador from Mohammed executed. This caused the first war between the Moslems and the Christians; the Moslems were beaten with great loss.

Mohammed now saw the importance of regaining the holy city and prepared what afterward came to be known as the «First Pilgrimage.» In 629 he appeared before the gates with 1,400 of the faithful. He succeeded in making a peaceful entrance, telling the Koreishites that he was on a mission of peace and wished only to worship in the Caaba. He and his followers were granted three days for this purpose and left on the fourth day, but not without having won over many Koreishites to the new faith, among them being Amru, Othman and Khaled. Soon after this Mohammed nearly died from the effects of poison administered to him by a Jewess.

He now determined to wrest Mecca from the hands of the Koreishites; in 630, or the 8th year of the Hegira, he marched against the city with 10,000 soldiers. The inhabitants gave up the holy city into Mohammed's hands, receiving their life and liberty providing they accepted the faith of Islam. The Caaba was refinished, the idols thrown down, but Mohammed wisely refrained from destroying the ancient Black Stone, regenerating it with his own holy touch. Thus the temple became the sanctuary of the faith of Islam. This exercised a wonderful effect all over Arabia and the next year (9 of the Hegira) embassies arrived from all points of the compass to make submission. This is called «The year of Embassies.»

In order to intimidate Heraclius, the emperor, Mohammed marched into Syria half way to Damascus, at the head of an army composed of 20,000 foot soldiers and 10,000 horse, but returned to Medina without making an attack He then extended free worship to the Christians in consideration of tribute, added a new chapter to the Koran, revoking all regulations in favor of idolaters, and then promulgated his great and last pilgrimage to Mecca, known as the «Valedictory Pilgrimage.» It was toward the close of the 10th year of the Hegira that he started this pilgrimage accompanied by a throng estimated at from 40,000 to 150,000 persons. He preached to them from Mount Arafat, exhorting the faithful to piety and righteousness, to abstain from sin and to protect the weak. On his return to Medina he fell sick and declined rapidly. He gave instructions that Abu Bekr and Usama, the son of Zaid, should be the leaders of the army, and expired in the arms of his favorite wife, Ayesha, 12th day, 3d month, year 11 of the Hegira (7 June 632 A.D.). He was buried in the house of Ayesha where he died. It afterward was annexed to an adjoining mosque which became a place of pilgrimage for generations of Mohammedans.

Mohammed's personal appearance, to judge from Arabic tradition, was neither imposing nor pleasing, but inspiring. He was not above medium height, but was broad-shouldered and deep of chest; he was strongly and compactly built; head, large; brow, high; face, round and ruddy; mouth, large; nose, long and aquiline. His eyes, large, black and fiery, were full of his peculiar magnetic personal power. He wore his black hair long and curly and his beard remained unwhitened at his death. A large birthmark between his shoulders was looked upon as the holy mark of prophecy. His personality was strong and dominant, but his domestic life was as simple as was his frugality at meals. He was kind and generous, a tender father and a loyal friend. Even at the height of his power he lived in a miserable hut, slept upon straw and his pillow was made of palm leaves covered with leather. His life was withal a strange contradiction, for at times he was deceitful, cunning and cowardly, and in his later years gave way to gross sensuality. His mind in spite of his religion contained a strong admixture of superstition; he believed in omens, charms and good and bad spirits. Spasmodic convulsions always accompanied his visions or divine revelations, and by many were attributed to his disease of epilepsy. At such times he would perspire profusely and remain in a weakened condition for some time after.

As a political leader and a religious reformer Mohammed undoubtedly ranks among the greatest. Whether a real prophet or a charlatan, or a mixture of both, we cannot strip him of the qualities of greatness. His name has survived 12 centuries and his followers to-day number over 175,000,000 living souls. (See ISHMAELITES; KARMATHIANS; KORAN; MOHAMMEDANISM; SUNNITES; WAHABEES; SUNNA, etc.). Consult Biographies by Sir William Muir (1851–61; abridged 1894); Nöldeke (1863); Weil (1864); Sprenger (1869); Krehl (1884); Lamairesse and Dujarric (1898); also, Wellhausen, 'Muhammed in Medina' (1882); Müller, August, 'Der Islam im Morgen- und Abendlande' (1885); Muir, 'Mahomet and Islam' (1887); Seyd Ali, 'Life and Teachings of Mohammed' (1891); Muir, 'The Caliphate' (1891); Pool, 'Studies in Mohammedanism' (1892); Margolionth, D. S., 'Mohammed and the Rise of Islam' (1905). Also consult other works quoted under MOHAMMEDANISM; KORAN, and kindred subjects.

MOHAMMED I, Turkish sultan: b. 1375; d. 1421. He was son of Bajazet I, after whose death (1403) he became prince of Asia Minor and rival of his three brothers for the throne, to which he came in 1413, as the successor of Mousa. During his reign of eight years he strengthened the empire, which was suffering from the recent assaults of Timur (or Tamerlane), pushed its boundaries as far as the Danube and fostered friendly relations with the Greek Empire abroad, and literature, arts and sciences at home.

MOHAMMED II, Turkish sultan: b. Adrianople, 1430; d. 1481. He succeeded his father, Murad II, in 1451; two years later undertook the siege of Constantinople, which he carried by storm after 53 days' siege; made the city his capital; made war on the Greek rulers in Morea and Trapezus, on Hunyadi of Hungary, on Scanderbeg in Albania and on Venice, winning for his empire the provinces of Bosnia and Serbia, as well as Eubœa and Scutari (from Venice) and Kaffa (from Genoa), and for himself the names el-Ghazi, «the Conqueror,» and Buyuk, «the Great.» His conquests had extended as far north as the Crimea, and in 1481 had seized Otranto as a preparatory step to war on Naples, when he suddenly died.

MOHAMMED III, Turkish sultan: b. 1566; d. 1603. He succeeded his father, Murad III, in 1595, assuring himself the throne by the execution of his 19 brothers. He captured Erlau in Hungary (1596), but was unsuccessful in his further movements in Europe, being attacked in Asia by Abbas the Great, Shah of Persia.

MOHAMMED IV, Turkish sultan: b. 1642; d. 1691. His father, Ibrahim I, was murdered by the Janizaries when Mohammed was only seven years old. He came to the throne under the nominal regency of his grandmother, which was soon exchanged for the actual control of the grand-viziers, the Kiuprili. Turkey's foreign policy was aggressive and successful under them; but in 1683 Kara Mustafa was defeated before Vienna. The Holy League, composed of Poland, Russia, Venice and Leopold I, Roman emperor, then steadily gained victory after victory over the Turkish army, which rose against Mohammed, imprisoned him in 1687 and let him die in chains four years after the accession of his brother, Suleiman II.

MOHAMMED V, 35th Turkish sultan in male descent of the house of Othman: b. 3 Nov. 1844; d. 3 July 1918. A son of Sultan Abdul Medjid (d. 1861), he succeeded his elder brother Abdul Hamid II (q.v.) on the latter's deposition and exile, 27 April 1909. From his early manhood until the day when he was unexpectedly placed on the throne in his 65th year, Mohammed Reshad Effendi — as he was called — had been a state prisoner in close confinement in a palace on the Bosphorus. By the law of succession observed in the reigning family, the crown devolves according to seniority upon the male descendants of Othman (the founder of the empire) sprung from the Imperial Harem, whence all children, whether of free women or of slaves, are legitimate and of equal lineage. During his long captivity Mohammed had seen three sultans come and go — his uncle, the gloomy Abdul Aziz, and his two brothers, the insane Murad (d. 1902) and the «Great Assassin,» Abdul Hamid (d. 10 Feb. 1918). All three had been deposed after reigning 15 years, three months, and 33 years, respectively. Of very limited education, totally ignorant of the world and inexperienced in the mysteries of state-craft, he had been dragged from obscurity in his old age and suddenly made the ruler of 20,000,000 people. Mr. Morgenthau, former United States Ambassador to Turkey, described him as «simply a quiet, easy-going, gentlemanly old man» of a «benevolent, gentle nature.» Lacking the strength and cunning of his famous brother, he easily became a quiescent tool in the hands of the Young Turkey leaders. His personal share in the government of Turkey before and during the war may be described as *nil*. He was succeeded by Mohammed VI. See TURKEY.

MOHAMMED VI, 37th Turkish sultan of the house of Othman: b. Constantinople, 12 Jan. 1861. Wahid-ed-din (which was his former name) is a son of Sultan Abdul Medjid and the 14th child of that monarch. He is thus the youngest brother of his three immediate predecessors on the throne — Murad V, Abdul Hamid II and Mohammed V. He became heir to the throne on the death (by murder or suicide) of his cousin Prince Yussuf Izzedin in February 1916. On the death of Mohammed V on 3 July 1918, Wahid-ed-din succeeded him under the style of Mohammed VI. He found his country disorganized and at war, with the government in the grasp of Enver Pasha, Talaat Bey and German officials. Three months later the two virtual rulers of Turkey fled and the sultan was compelled to sue for peace in a note to the United States government dated 12 Oct. 1918.

MOHAMMED AHMED, äh'mĕd (The Mahdi). See MAD MULLAH.

MOHAMMEDAN ART. The Mohammedan or Moslem culture, which from insignificant beginnings developed its military power with such extraordinary rapidity in the 7th century of our era, by subjugating nearly all western Asia, northern Africa, Spain and later Sicily and Sardinia, was at the outset almost wholly destitute of art. It was the Arabs who led in these conquests; the Moors who overran Spain were largely of Arabic blood, and the Arabs were not at first artistically gifted. Like the Mongols and the Turks, who were later concerned in the advance of Islam (as the Mohammedans call their faith), the Arabs and Moors were at first wholly dependent on the peoples they conquered for their art, and especially for their architecture; upon the Syrians, Assyrians, Armenians, Persians, Byzantine Greeks, the Copts of Egypt, the Christians of North Africa, the Spaniards and Sicilians, all of them Christians except the Persians. But the conquerors imposed upon their Christian and Persian builders and artists special programs and requirements due to their faith, and in the course of centuries developed predilections and aptitudes wholly their own, which gave to all their arts an Oriental character wholly unlike that of the Western arts from which they were derived. The name «Saracenic,» commonly applied to all Moslem art, is an unscientific inheritance from the age of the Crusades.

The development of this art took place during the early Middle Ages, when European culture was slowly and painfully emerging from the chaos of the centuries following the fall of Rome. It produced a civilization and an art that flourished with extraordinary brilliance. Bagdad, Cairo, Cordova, Granada, Toledo, Kairouan (Cyrene) and other cities of Arabia, Persia, Spain and North Africa, were for some centuries more splendid than any European city outside of Constantinople. Moslem universities were great centres of learning; the Arabs cultivated mathematics and philosophy with enthusiasm, and the textile arts, ceramics and metalwork were carried to so high a degree of perfection that they powerfully affected European art as late as the 16th century.

Historical Development.— During the first century after the Hegira (622–722 A.D.) the Arabs conquered Syria (634–642 A.D.); the Sassanian empire of Persia in 642; Armenia and Mesopotamia in 644, and part of northern Africa in 645–692. Sicily was occupied early in the 9th century. The Ommyad sultans subdued the rest of North Africa during the 7th century and extended their conquest into Spain (710–713), where they established the independent khalifate of Cordova, as a rival to the Abbassid khalifate of Bagdad. The 9th and 10th centuries were a period of exceptional brilliancy in Moslem history: the age of Haroun-er-Reshid, of El Mansur, of an almost fabulous splendor in Bagdad, of conquests in Sardinia and Malta and of widespread architectural activity. During the 7th and 8th centuries the original mosque of Omar at Jerusalem (of which the present so-called «Mosque of Omar,» really the Kubbet-es-Sakhra, is a much later successor), and that called El Aksah in the same city; the mosques of Amrû at Cairo and of El Walid at Damascus and the Great Mosque at Cordova had been built; during the 9th and 10th centuries the celebrated mosque at Kairouan, the mosques of Ibn Tûlûn and of El Azhar at Cairo were built and that of Cordova greatly enlarged. Under the Fatimite dynasty, which succeeded the Toulûnids in Egypt in 969, there began the practice of erecting domes over tombs and sepulchral chambers, and the earliest minaret was built in Cairo. But the greatest architectural activity in that city occurred under the Ayubite and Mameluke sultans of the 13th and 14th centuries, to which belong the splendid mosques of Kalaûn (1284), Hassan (1356–79), Barkûk (1384), Muayyad (1415) and Kaït Bey (1465), and the remarkable group of domed and minareted tombs of the Karafah quarter, commonly known as the tombs of the Khalifs and of the Mamelukes.

The culmination of Hispano-Moresque architecture came somewhat earlier — singularly enough during the period of the disintegration of the Moorish power in Spain. The famous Giralda tower at Seville (1160), the Alcazars or castle-palaces of Seville and Malaga (1181–1310) and the Alhambra at Granada (1248–1306), are the most noted extant products of this age.

Although Persia was so early subdued by the Arabs, and by the artistic proclivities of the people became the parent of Mohammedan art in Bagdad and Mesopotamia and later in Turkestan, nearly all the early monuments of Persian architecture were destroyed in the Mogul invasions of the 11th–13th century. The recovery in architecture was slow until the accession of the Sefavieh or Sufi dynasty in 1478, when there ensued a remarkable revival of all the arts in the cities of Ispahan, Tabriz, Aminabad, Hamadan, Shiraz, etc., with the building of great mosques, bazaars, caravanserais and bridges, and a great development of decorative art in rugs, printed fabrics, ceramics and manuscript-illumination.

The conquest of the Indian states by the Mohammedans was late, gradual and incomplete, and neither the Hindu religion nor the native Hindu art was ever extinguished, even in those regions longest subject to Islam. Northern India was conquered in part in 1192, and developed a style in which Persian and Hindu forms are inseparably blended, as in old Delhi and Ajmir. In other provinces during the next three centuries Mohammedan mosques and palaces were built in various local styles; but it was the Mogul sultans (1494–1706), who in India as in Persia developed the arts, including architecture, with the greatest splendor, especially in the magnificent mosques, palaces and tombs of Bijapûr, Allahabad, Secundra, Delhi and Agra and their suburbs. In this period Persian conceptions and influences are dominant, but the Hindu traditions are also plainly manifest.

Turkey was the latest of the Moslem empires to develop a characteristic art. The Seljûk Turks who had settled in Asia Minor in the 11th century, and had built up a notable capital at Iconium (Konieh) under the influence of Persian art, were superseded by the Ottoman Turks in 1299 under Osman, the founder of the present dynasty. By the capture of Constantinople in 1453 (having captured Adrianople nearly a century earlier), the Turks became masters of the Byzantine Empire. The resulting development in the arts shows a mingling of Arabic, Persian and Byzantine elements, the latter predominating in the architecture of the mosques.

In China the Mohammedan element has been too feeble to produce any vital and characteristic Moslem art.

General Characteristics.— While in Mohammedan art five distinct style-developments are easily recognized — the Arabic, Moorish, Persian, Indo-Moslem and Turkish — certain common characteristics run through them all, due in part to the religion, in part to the Asiatic source of all the Moslem peoples. The Koran forbids all representation of living beings, and sculpture in all its forms is rigidly proscribed, while pictorial art, and even the use of pure nature-forms in ornament, are equally rejected except by the Persians, who belong to the Shiah sect, and the Moslems of India. Everywhere else decorative art has been restricted to purely conventional motives, or to nature-forms so conventionalized as to be hardly recognizable. In spite of this restric tion, it is in the arts of decoration that the Mohammedans have always been the strongest. In these arts the Asiatic love of color and of surface ornament is everywhere evident, in contrast to the European predilection for plastic decoration based on structure. In all Moslem styles minuteness of detail and intricacy of composition are preferred to the clarity and repose of the European styles, and brilliant color, broken up into minute elements and covering broad surfaces, is preferred to those effects of light and shade produced by sculpture and carving in varied relief. In the wall-decoration of the architecture the traditions of rug-design seem to dominate. Common to all the architectural styles are certain motives: the interlaced star («star of Solomon»), the honeycomb or stalactite motive and decorative inscriptions in the Cufic, Persian or Arabic forms of lettering. Arches, of whatever form, are almost invariably enclosed in rectangular panels or decorative frames.

Architectural Styles and Monuments.—As Gothic architecture received form in the building of cathedrals, so the Moslems developed theirs in the building of mosques. A mosque is primarily a prayer-hall, the ceremonial prayer of adoration of Allah being the chief element in the Islamic worship. And since all prayer must be made toward Mecca, the holy city, the one prime essential of the mosque is the *mihrab* or niche in the side of the hall toward Mecca, indicating the *kibleh* or ritual direction of worship. To the right of this, in the larger mosques (Jami, Jouma or Jumma mosques), is a *mimber* or high narrow pulpit from which the Koran is read on Fridays. There is usually in front of the mosque an open court surrounded by arcades, entered by one or more lofty gates, and having in the centre a fountain for the ceremonial ablutions without which the worshiper is deemed unfit for prayer. To nearly all mosques are attached one or more minarets from whose exterior galleries the *muezzin* chants daily at the appointed hours the far-sounding call to prayer. These requirements permit of the utmost variety in plans and detailed arrangements, which differ widely in the five principal styles.

Of these five styles the *Arabic* has less unity than any of the others. It may, indeed, be divided into three sub-styles: the Syrian, based upon the Syrian-Byzantine architecture and later influenced by the Romanesque works of the Crusaders; the Mesopotamian, dominated by Persian influence, as at Bagdad; and the Egypto-Arabic or Cairene, springing from Coptic prototypes, and by far the most distinctive of the three. It is characterized by the pointed arch, the ovoid or pointed dome decorated in relief, with or without a drum; minarets square below, with two or more diminishing stages and much surface-ornament; the use of stalactite corbeling, of marble veneering internally and of carved and painted beamed ceilings. The buildings are seldom large in scale, even when covering large areas; height and spaciousness are not sought after, as a rule. The material of construction is usually brick, faced externally with stone or with stucco. The entrance doorway is made impressive by setting it in a deep and lofty niche. Vaulting is chiefly confined to the domes over sepulchral chambers, a feature introduced in the Fatimite period from Mesopotamia, whence also came the minaret. The early mosques in Cairo, as generally elsewhere also, consisted of a court surrounded by arcades, and the prayer-hall was simply a multiplication of these arcades on the side toward Mecca. But the Hassan mosque (1356) is exceptional in its prayer-hall covered by a huge barrel-vault of 70 feet span, and the «Mosque of Omar» at Jerusalem in its concentric circular plan and vast wooden dome. Later it became customary to incorporate in the mosque not only one or more sepulchral chambers, but also hospitals and rooms for priests and for schools and other purposes. After the Turkish conquest by Selim in 1517, mosques were sometimes erected in Cairo after the Constantinople type, with broad domes over the prayer-hall (Boulak, 1520; Mehmet Ali, 1821). The Arab houses of Cairo, built on the street, are noted for their fronts of *mashrabiyé* lattice-work. Woodwork of intricate star-paneling inlaid with mother-of-pearl and ivory appears in doors and *mimbers*, and decorative tile-work is freely used in interiors — an art imported from Persia.

The *Moorish* style, of which the Hispano-Moresque is simply the Spanish development, employs the horseshoe arch, often cusped; slender columns with carved capitals, often of cubical form above a high necking; massive square towers for minarets, and a system of wall-decoration in stucco, stamped or molded in intricate surface-patterns brilliantly colored, above a wainscot of colored tiles. Domes and vaults are very rare. Both stone and brick are used in construction, and external patterning in relief is a frequent feature of external brickwork, as on the Giralda at Seville. Both in Africa and Spain the decorative element predominates over the structural. The most noted monuments have been mentioned; others at Fez, Tangiers, Algiers, Tlemcen, both mosques and palaces, are of interest.

The *Persian* monuments differ in style from the Arabic and Moorish, alike in plan, construction, form and decoration. The bulbous dome, the round minaret with a roofed gallery and bulbous top, the four centred pointed arch, portal-niches of huge size, and the veneering of the whole exterior with figured tiles in brilliant colors, give the Persian mosques an aspect nowhere else to be met with. Brick is the universal material of construction, and vaulting of great intricacy is everywhere used, alike in mosques and in secular buildings. In palaces wooden posts and wooden ceilings are common, brilliantly painted; but otherwise columns are infrequent. The principal mosques belong to the Sufi period, though the ruined mosque at Tabriz and the tomb of Khodabendeh at Sultanieh are of the early 14th century. The great square or Meidan, the mosque and college and the Palace of the Mirrors, all at Ispahan, the caravanserai at Aminabad, and bazaars, bridges and mosques at Shiraz, Hamadan, etc., are notable examples of the style, to which may also be credited the fine though ruinous mosques at Bokhara and Samarcand, in Turkestan.

The various pre-Mogul Indian styles show a mixture of Hindu and Persian forms (e.g., mosque, gate and tomb of Altomsh at Old Delhi, mosques at Ajmir, Ahmedabad, Gujerat, Kalburgah, etc.). The Mogul conquest introduced an entirely new architecture, Persian as to its forms, which include the bulbous dome, round minaret, great niche-portals and the four-centred arch. But it is an architecture of sandstone and marble, not of brick and tile, and is superior to the Persian in the scale, dignity and setting of its monuments. Among the most important of these are the mosques at Bijapûr, Agra (Muti Musjid or Pearl Mosque), Delhi (Jumma Musjid), and Fathpûr-Sikhri; the great palace groups at Delhi and Fathpûr-Sikhri; the tombs of Akbar at Secundra and of Humayûn at Agra, and the incomparable Taj Mahal near Agra, the tomb of Shah Jehan and of his queen, Mumtaz-i-Mahal.

The earliest *Turkish* architecture, the Seljûkian, was an offshoot of the Persian. When the Ottoman Turks established their new capital at Brusa (1300), they employed at first the Seljûk style, as in the «Green Mosque»; but after the capture of Constantinople in 1453 the Byzantine influence became paramount in the plan and construction of mosques, while the details betray mingled Arab and Persian origins. Of all the Mohammedan styles this is the most purely structural in masses and conception, and the most imposing in scale. The great mosques follow the prototype of Santa Sophia (q.v.), covering vast interiors with a lofty central dome and a combination of half-domes and cupolas; the minarets are round, with one or more galleries and a slender lead-covered spire. The Turks employ the simple pointed arch with alternating voussours of light and dark marble, enclosed in a rectangular panel; marble columns with stalactite capitals; stalactite corbeling and cornices, and a combination of tiles and painted ornament for interior decoration. All their finest buildings are of white marble; they include the Mehmediyé Mosque at Constantinople (1460), the great Selimiyé at Adrianople (1512–30), the Suleimaniyé Mosque and tombs and the Shah Zadé Mosque (1556), the Validé and Ahmet I mosques (17th century) and the Nouri Osmaniyé (1756), all at Constantinople, besides many fountains, and several palaces built in the 19th century of a showy but inferior type.

The Decorative Arts.— The Asiatic races have always excelled in surface-decoration, especially in the use of color. Among them the Moslem nations have displayed great skill not only in the application of surface-decoration to buildings but also in many forms of textile and ceramic art and in certain kinds of woodwork and metalwork and even stained glass. In *textiles* the place of honor belongs to the rug-weavers of Turkey, Persia and India, whose art in this field is descended from very ancient times when Babylonia led the world in decorative weaving. The Turkish rugs, including those from Mesopotamia and Turkestan, are distinguished by their purely conventional patterns, composed almost entirely of rectilinear and angular motives. The Persian and Indian rugs are esteemed the finest; in these the patterns are in flowing lines, with liberal use of leaf and floral forms semi-naturalistic in treatment. The Persians also produce remarkable hangings printed in colors by hand from engraved wooden blocks on cotton or linen. Both India and Turkey have produced remarkable needlework in colored silk on broadcloth or cotton; but this art has nearly disappeared in Turkey. The Armenian and Syrian laces are of great beauty, but they are mostly the work of Christians, not Mohammedans. In *ceramics* the Persians have been from a remote antiquity the leaders among the Moslem nations. They inherited the art from the ancient Babylonians and in turn taught it to the Arabs of Egypt and the Moors of Spain, and later to the Turks of Asia Minor. (See CERAMICS). Their use of patterned tiles for veneering the exteriors of their buildings has been already referred to. In all the Persian ceramics, both tiles and glazed pottery, floral patterns are freely used; the cypress tree, the rose, carnation or pink, peony and other flowers appearing frequently, as well as birds, gazelles and other animals. The Arabs and Moors, on the other hand, avoided, as far as possible, such naturalistic representations. The Turkish tiles and pottery approach more nearly the Persian types. In *metalwork* the Indo-Moslems excel the other Mohammedans, especially in chased and perforated brass vessels, and in niello-work — the incrusting of patterns in gold or silver in or upon iron or bronze; but it is not possible to distinguish the Moslem from the Hindu handiwork except where the chasing or incrusting of Hindu emblems betrays its non-Moslem origin. The kindred art of damascening, or the insertion of gold, silver or brass wire into grooves cut in iron or steel, originated, as its name implies, in Damascus, and was carried to great perfection by the Arabs, especially in the decoration of armor and weapons. The *woodwork* of doors and of *mimbers* or pulpits in Cairo and in Turkey and the *mashrabiyé* of Cairo houses have been previously referred to. A similar treatment of intricately-framed paneling and of spindle latticework is employed for both fixed and movable furniture. The Moslems of India also excel in perforated and carved woodwork for interior decoration. The art of *stained glass* was developed in Cairo, perhaps as early as the 14th century, and spread thence to Turkey in the 16th. The patterns are perforated in cement, and the perforations stopped with bits of colored glass, combined in harmonies of line and color.

Manuscript-decoration is in some respects the most distinctive of all the Moslem arts, and it is hard to decide which nation produced the finest works, though the palm would perhaps go to the Persians. The beauty of the Arabic lettering (of which the Turkish and Persian characters are mere variants) lends itself to decorative calligraphy in an eminent degree, while each of these nations has developed an art of supplementary adornments in color and gold, in borders, decorative panels and other forms of ornament, that rival the finest manuscript of western Europe. To these embellishments the artists of Persia and India add the resource of pictorial illustration in color, which the Arab and Turkish illuminators allow only in the rarest instances.

The decorative arts of Islam generally reached their highest attainment in the 15th–17th centuries, since when there has been a long and slow decline, though they are still practised with success in many parts of Turkey, Egypt, Persia and India.

Bibliography.— For the general subject the most important work is Saladin et Migeon, ‘Manuel d'art mussulman’ (Paris 1907); also Franz Pascha, J., ‘Die Baukunst des Islam’ (Darmstadt 1887). For *Arabic art,* Bourgoin, J., ‘Les Arts arabes’ (Paris 1873); Gayet, A. J., ‘L'Art arabe’ (Paris 1892); Migeon, G., ‘Le Caire’ (Paris 1906); Prisse d'Avennes, ‘La Décoration arabe’ (Paris 1885). For the *Hispano-Moresque,* Goury, J., and Jones, O., ‘The Alhambra’ (London 1842–45); de Prangey, G., ‘Monuments arabes et moresques de Cordoue,’ etc. (Paris 1832–39). For *Persia,* Coste, P., ‘Monuments modernes de la Perse’ (Paris 1867); Gayet, A. J., ‘L'Art persan’ (Paris 1895). For *India,* Fergusson, J., ‘Indian and Eastern Architecture’ (London 1910); Jacob, S. S., ‘Jeypore Portfolio of Architectural Details’ (London 1890–94); Le Bon, G., ‘Les Monuments de l'Inde’ (Paris 1887); De Forest, L., ‘Indian Architecture and Ornament’ (Boston 1887). For *Turkey,* Montani, ‘L'Architecture ottomane’ (Paris 1890); Parvillée, L., ‘Architecture et décoration turques’ (Paris 1874). For *Moslem ornament in general,* Jones, Owen, ‘Grammar of Ornament’ (London 1857); Racinet, A., ‘L'Ornement polychrome’ (Paris 1869–73).

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MOHAMMEDAN LITERATURE. The study of the traditions of Mohammed, in all their extended ramifications, comprises what might be termed Mohammedan literature; and as these are pre-eminently embodied in the Koran, that work, without striking literary art and mechanically constructed, became the incomparable classic of Islam, to give rise to schools of thought, to systems of theology and jurisprudence and to promote distinct branches of history, biography, criticism, science, grammar, philosophy, legend and poetry. It is curious how such a book, revealed in bits and scraps, arranged according to the length of the chapters, without uniform style, and whose text was not collated in the prophet's lifetime, should have been worshiped and idealized. But our Western mind cannot understand the Oriental point of view, and least of all the windings and complexities of the Semitic brain. Caliph Uthman had done away with all existing copies of the Koran except that of Abu Bekr, which itself was shortly afterward destroyed by Marwan, governor of Medina. All copies of the book to-day, wherever scattered, are reproductions of Abu Bekr's edition. Uniformity and authoritative text could apparently be secured in no other way. Out of the exegesis of the Koran sprang the most vital and varied elements in Arabic literary history, which began in primitive pre-Islámic times in the ceaseless caravan-marches across the deserts, where the camel's regular swing taught the Arab to sing rhymes. The more cultured Mohammedan of a later age is city dweller, and shares wider aspirations; but the Koran, not the desert, is still his starting-point, to which he always returns, whether he follows the simple monotheism of Mohammed or an agnostic mysticism.

It can readily be seen how history among the Arabs began with the *Maghazi* — books devoted to the study of Mohammed's wars. The deeds of that era were to be narrated, the chronicles and legends gathered, at second hand generally. Efforts to obtain information as to the prophet's life gave birth to biography, which was to develop in later centuries. Parallel with histories of wars and events were written histories of famous cities, like Medina or Mecca, Bagdad and the rest, most of which works have perished. Hov this field was cultivated can be shown from what is recorded of Tabari, the most illustrious historian (828–923), who for 40 years wrote 40 sheets a day. The oldest biography extant is that of the prophet by Ibn Ishaq (d. 767). The beginnings of the historical romances go back to the first centuries of Islam when veneration for Mohammed gave rise to legend and fable that passed as genuine history.

The literature of jurisprudence sprang naturally from the study of the *hadith* or sources of tradition. The Koran had to be supplemented at an early date to provide laws for the Moslem world. The sayings of the prophet after his death, his usages and decisions, had to be collected, arranged and sifted. The Koran itself was absolute authority, if it contained a law applicable to the case in hand; otherwise the memories of the *Sahibs,* the companions of the prophet, were resorted to for his rulings. If these proved of no avail, recourse was had to the common law of Medina, and finally to the common sense of the judge. Hence a vast legal literature arose — collections of traditions, called *Musnads,* because each tradition was «supported» against the companion from whom it came. One of the first and greatest of these was the ‘Misnad’ of Ahmad ibn Hanbol (d. 863). It was printed a few years ago in Cairo in six quarto volumes of 2,885 pages and is said to contain about 30,000 traditions going back 700 years.

Another type of tradition-book was the ‘Musannaf’ or «arranged,» — chapters classified according to their subject matter. Al Bukhari (d. 879) made the most respected of all the collections, termed *Sahih,* which is so arranged as to form bases for a complete system of jurisprudence. Another is that of Muslim (d. 883). These were the two most honored authorities. Four other legal collections, ‘Sunan’ («usages»), stand second to the two *Sahihs.* Different writers, however, give the number of canonical works as five, seven or even 10. It did not take long before the six great books were themselves abridged and explained — the rules of the faith were summed up into a selection of 40 traditions and these became the subject of endless commentaries. The Roman as well as the Rabbinical law had marked influence on Mohammedan law. Four schools of thought held sway, that of Abu Hanifa (d. 772), speculative jurist; of Malik (d. 801), historical jurist; of Ash Shafi'i (d. 826), reverent and conciliatory; and that of the pupils of Ahmad Hanbol (d. 863), reactionary. A fifth school, the Zahirite, whose discovery is due to Dr. Goldziher, founded by the Abu Sulaiman David ibn Ali (815–883) insisted on the external meaning of the Koran and the traditions and repudiated further tradition. «It never held rank,» writes Macdonald, «as an acknowledged school of Mohammedan law.»

With the deeper study of the Koran, two further branches arose — the science of reading the text and that of its interpretation. Oral tradition which was at first depended upon was soon followed by written tradition and books were compiled on the various ways of reading, some of which dating from the 10th century are preserved at Berlin, Algiers and Leyden. One book, written by a grave jurist, and entitled ‘Kitab Muhbarak’ (Blessed Book) is a story of those who died listening to the reading of the Koran. In the line of exegesis, the array of books is overwhelming, the mystical in large number. Hence arose the increased study of grammar, most of the commentators being grammarians.

In the department of theology, whole libraries have been written. Ghazali, one of the most famous masters (1049–1111), wrote 69 works that are extant. Like its jurisprudence, Mohammedan theology could not begin until after the prophet's death. At first it was more political than religious but soon settled down to more or less logical wrangling between sect and sect. Christian, Jew, Persian, Greek alike had their influence, with developments now rational, now mystical, now radical, now pantheistic, giving birth to countless works, some of which are almost modern in their suggestions and implications. They prove the fertility and the intensity of the Mohammedan intellect and what marvelous power existed in the prophet to have supplied thought for so many ages and to so many minds.

Bibliography.— The best recent books which can be recommended are Huart, Clement, ‘A History of Arabic Literature’ (New York 1903); Macdonald, Duncan B., ‘Development of Muslim Theology, Jurisprudence and Constitutional Theory’ (New York 1903).

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MOHAMMEDAN SECTS. As Islam constitutes more than a religion and is in reality a combination of religion, politics and jurisprudence — elements which entered into the problem in the early centuries and have continued ever since — it is natural that schisms should occur and sects rise and decline from age to age with the varying national and historical conditions. The rise and development of doctrine among the Mohammedans cannot be separated from the rise and development of historical and national traditions. Many influences contributed to the consequent growth of sects and their distinguishing factors. The culture of neighboring lands, their literary and theological atmosphere, was an undeniable factor. Both Jewish and Roman law exercised a profound influence and led in time to much controversy. Just as the Koran illustrates three lines of influence — Christian, Jewish and what we term heathen, the prevalent customs or modes of thought of the peoples among whom they lived were reflected largely in the conceptions of the Mohammedans. Perhaps, too, it was necessary for the faith to assume such characteristics, to facilitate its diffusion and make its proselytes feel more at home. Here was a fruitful field for the growth of sects. Then must be considered the effect of extended geographical divisions. Islam embraced Arabia, Persia, Syria, Egypt, the coast of North Africa, central Asia to China, with Spain in Europe, India and the islands of Malay. What active sources for antagonism and division, what favorable soil for mystic, ascetic, pantheist, rationalist with their ever-varying phases! Then, further, the Semitic races with their tendency to segregation have an innate militant spirit that leads if not otherwise checked to fanaticism and the formation of sects. The fact, too, that Islam grew so rapidly and wielded for so many centuries a remarkable sway in science and knowledge intensified the conflict of opinion, often to be decided by the sword within the fold.

The sects at the first glance seem endless from our point of view. An old tradition ascribes to Mohammed the saying that Islam would be divided in time into 73 parties. Arabian writers, with their different classes and divisions, multiply that number several times, the discrepancy being due to the want of system and the lack of a common basis of classification. Sharastani (d. 1153), whose account of religious sects and philosophical schools is chief source-book, arranges the sects under six headings: Mu'tazalites, Jabarites, Sifatites, Kharijites, Murpiites and Shi‘ites, upon which a list of a hundred names and more has been founded. Many of these have disappeared; four, however, continue to our day over large portions of the world of Islam and stand on the common basis of the *sunna* or orthodox traditions. These are the Hanafites, the Shafi‘tes, the Malikites and the Hanfalites.

Before discussing more closely the names and history of these sects one must refer to the vital point in Arab law, philosophy and theology — the historical basis of creed and dogma in their widest sense. It was religion not politics that produced the first schism, which still remains unhealed. The point at dispute is the successor to the prophet and ruler of Islam (Imam). Here we have a sharp division between legitimist and illegitimist, orthodox and heterodox, with their endless disputes and antagonisms, more or less clearly enunciated. On the one side are the Sunnites, those who follow the *Sunna* or tradition to which belong the overwhelming majority; on the other the Shi‘ites, from *Shia*, a party or sect, who constitute the largest numbers of dissenters. After the battle of Siffin (657) when Ali and Moawiya were rival claimants to the caliphate, and the former lost in the arbitration, the breach was made. The Shi‘ites broke away and became the protestants or dissenters, holding that the succession belongs to the house of Mohammed and to Ali as his son-in-law, and ever after to the direct blood relations and descendants in the line of the prophet's daughter Fatima, the wife of Ali. The Shi‘ites themselves are divided according to which branch of the descendants they recognize. Its high church or sect of the «Twelvers,» called also Imamites (they prefer the term Imam to Khalifah) traces its claim to Ali and transmits from father to son until the 12th Imam, Mohammed b. Hasan «ul Askari.» In his eighth year he is said to have vanished and it is held by this sect of «Twelvers» that he has lived since then in secret, to appear at the last day as Imam Mahdi! The Fatimites, another branch of the Shi‘ites, founded a dynasty of some strength for a time in North Africa and Egypt (909–1171). It can readily be imagined how theories of incarnation have arisen among the Shi‘ites in their extravagant reverence for

Ali and his wife, who have become almost tutelar deities and endowed with superhuman dignities. It was only a short step to Gnosticism, which also developed in Islam, due largely to Babylonian and Persian ideas. The present day Druses constitute one of the sects that show the survival of these tendencies.

The dissatisfaction in the Eastern half of the caliphate with the Omayyad dynasty gave impetus to Shi'ites growth and many leaders founded sects of their own, with some of which obedience to a person not to law was inculcated as a religion. There is little doubt that the decline of the Omayyads and the success of the Abbasids was due in considerable measure to the aid of the Shi'ites, the early caliphs of that dynasty, until Motawakkil, belonging to that sect. The Shi'ites are divided by Shahrastani into five divisions, of which the Isma'lites, the followers of Isma'il, the sixth Imam, have given rise, owing to the propaganda of Abd Allah ibn Maimun, to the Carmathians, Fatimites, the Assassins and the Druses. In Persia the Shah is the temporary substitute for the vanished Imam. The differences of the Shi'ites apart from the question of the succession are due to adapting the rites of Islam to the Persian nationality and concern minor matters of ritual. They have their own collection of traditions, but the prayers are almost identical with those of the Sunnites, although there is no obligation to attend public worship in the lack of a legitimate Imam. Saints are zealously worshiped — religious feasts are multiplied. The Koran is also their source of law. Next to the clergy (*Mollahs*), the dervishes wield the greatest religious influence. New sects appear among the Shi'ites from time to time — the latest being Babism, founded in Persia (1844–45) by Mirza Ali Mohammed and his successors, who held to the view of progressive revelation and display a high intelligence and ethical strength — at least in later writings. The sects that have survived and represent the great majority in Islam have been briefly mentioned as followers of the Sunna. The Hanafites spring from the school of the Imam Abu Hanifah (767), predominating to-day in Turkey, central Asia and in India. The Shafiites, called after Imam Al Shafii (d. 819), are to be met in Egypt, southern Arabia, the Dutch colonies and in German East Africa. The Malikites, named after Malik Ibn Anas, the famous Imam of Medina (d. 795), can be found in northern Africa and in Upper Egypt. The Hanbalites, rigid traditionalists, with the accompanying fanaticism, look back to Imam Ahmad ibn Hanbal (d. 855). Declining after the 15th century, the sect or school revived in the 18th, when the Wahabite movement arose in central Arabia, adopting its viewpoint of reform. Corresponding to the monastic orders in Europe, brotherhoods have arisen in Islam, which assume the importance of distinct sects, like the order of dervishes. The latest is the Brotherhood of As-Sanusi, established in 1837, of a «severely reforming and puritanic character,» as Macdonald expresses it. Holding to the strictist monotheism, all customs and ideas that «do not accord with the view of the exact letter» of the Koran are prohibited. A theocratic state has been founded in the eastern Sahara, between Egypt and Tripoli, from which missionaries are sent to establish houses throughout North Africa and Morocco and far into the interior. Mecca is an important centre for the new cult, into which pilgrims and the Bedouin are initiated in large numbers. In marked contrast are the Ibadites, who take their name from Ibn Ibad, associated with one of the earliest Mohammedan sects. They are found in Zanzibar and the coast of East Africa and in Algeria, where they maintain a certain simplicity and hold their primitive theological and legal views. It is forbidden them to marry other Muslims. The Ibadites in reality go back to the more modern elements of the Kharijites, one of the earliest parties in Islam, who organized themselves after Ali's rejection for the caliphate as an independent body. Literally «goers out,» as the name implies, they are opposed to all other parties, as renegades to be killed at sight. Their democracy was absolute — the caliph could be of any family, to be elected and deposed by the entire Muslim community. A picturesque if narrow sect, they have maintained themselves as an offshoot in a remote corner of the Islam world.

In the days of Ommayad caliphate (661–750) the three centres of religious thought — Damascus, Medina and the East — were open to non-Mohammedan influences and two heretical sects arose — the Murjiites and the Qadarites. The former postponed — hence their name — the judgment of human actions until the day of judgment. They held, too, that no believer in the unity of God and his apostle Mohammed would meet everlasting death — a heresy in that day. The Qadarites opposed predestination and free will and claimed that man had power over his actions — heretical doctrine in the world of Medina to be punished by death. In the East, with the Christians, Buddhists, Zoroastrians and the rest in close contact with the Mohammedans, rationalism arose in the sect of Mu'tazilites or «separatists,» who wielded great influence and shared the favor of the state until 849, when orthodox doctrines again held sway. The Koran, tradition, reason, custom, were pivots upon which both schools of law and of theology turned, but although the schools were many not all gave rise to special sects that had any lengthy existence.

The sect of the Mu'tazilites might have attained a much wider activity had not Ash'ari (873–935) in his 40th year changed from rationalist to orthodox and founded a scholastic theology of his own which was effective. Holding a mediate position between extreme views on most points, his platform became dominant among the Shafi'ites. He asserted that God's attributes cannot be compared to human attributes. As to free will, he maintained man's responsibility, if denying his power. Despite occasional attacks and persecutions, this theology made its way East and West and is the prevalent system. The system of al-Matiridi, a Hanifite (d. 945), is its only active opponent to-day, represented by the creed of an-Nasafi, still used as a textbook in schools. Of the 13 points of difference between Mataridi and Ash'ari, Macdonald states that Muslim theologians admit seven are not much more than combats of words. Even Ghazzali, in most respects the greatest and most representative of Muslim theologians, accepted the system of

Ash'ari. Apart from the Wahabite movement in Arabia and the more recent Babism in Persia, Muslim orthodoxy has not been disturbed by new sects of any significance.

Bibliography.— Goldziher, Ignaz, ‘Mohammed Studien’ (Halle 1889–90); Hughes, A., ‘A Dictionary of Islam’ (London 1885); Haarbrücker ‘Asch-Scharastani's Religionsparteien, übersetzt und erklärt’ (Halle 1850–51); Macdonald, D. B., ‘Muslim Theology, Jurisprudence and Constitutional Theory’ (New York 1903, with four pages bibliography); Müller, ‘Der Islam un Abendland’ (Berlin 1885–87); Schreiner, ‘Beit. zur Gesch. der Theolog. Beweg. in Islam’ (Z. D. M. G. 11, pp. 463 ff., 513 ff.; 111, pp. 51 ff.); Sell, E., ‘The Faith of Islam’ (London 1896); Steiner, ‘Die Mu'taziliten’ (Leipzig 1865); Von Kremer, ‘Gesch. der herrsch. Ideen des Islams’ (Leipzig 1868), and his ‘Culturgesch. des Orients unter den Chalifen’ (Leipzig 1873). Burton's ‘Personal Narrative of a Pilgrimage to Al-Madinah and Meccah’ (London 1898) throws light on present-day Mohammedan sects, despite the author's diffuse style.

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MOHAMMEDANISM is the term frequently given to the religion taught by Mohammed, but not used by the followers of that religion. Abu-Bekr, the first caliph, is reported to have said that it is not Mohammed, but the God of Mohammed, that we worship. The term by which the religion is known, wherever professed, is Islam, «submission to the will of God.» Those who embrace Islam are called Muslim (frequently written Moslem), a participle of the same stem from which the verbal noun Islam is derived. Still another term, used as the equivalent for Moslem, is Mumin, «believer.» It, likewise, is a participle, formed from the stem that gives rise to the word Imân, «faith.»

Islam is the religion professed by Turkey, Syria, Palestine, Arabia, Persia, Asia Minor, Afghanistan, Baluchistan, Turkestan and the Malay Peninsula. India has more than 57,000,000 Moslems. China has about 25,000,000. Owing to the great difficulty of securing exact figures, an accurate statement is impossible. It is generally estimated at 175,000,000.

Islam is divided by the theologians into two heads: Imân, «faith,» and Din, «practice.» The separate articles of both heads are determined by the Koran, the Traditions or sayings of Mohammed and the decisions of the learned officials. Under Imân are given six cardinal points of belief, as follows: belief in God and his unity; belief in angels, and good and bad spirits; belief in the Koran and revelation; belief in the Prophet; belief in the resurrection and the judgment day; belief in God's absolute rule of the world. «There is no god but Allah, and Mohammed is his envoy.»

As to Islam's conception of the deity He is above all omnipotent. No phrase occurs more frequently than this: «and He is powerful over all things.» He is omniscient; «And He knoweth all things,» is a phrase equally often met in the Koran. «With Him are the keys of the secret things; none knoweth them besides himself: He knoweth that which is on the dry land and in the sea; there falleth no leaf but He knoweth it; neither is there a single grain in the dark parts of the earth, neither a green thing nor a dry thing but it is written in the perspicuous book.» (Sura 6, 59). «He is the ever-living, eternal God.» «God! there is no God but he; the living, the self-subsisting; neither slumber nor sleep seizeth him; to him belongeth whatsoever is in heaven or on earth.» (Ibid.). He is, moreover, the creator of all things. «His is the kingdom of heaven and earth; he giveth life and he putteth to death; and he is almighty. He is the first and the last; the manifest and the hidden; and he knoweth all things. It is he who created the heavens and the earth in six days, and then ascended his throne.» (Sura 57, v. 2). His word alone creates, «When he decreeth a thing, he only saith unto it, ‘Be, and it is.’» (Sura 3, v. 4), cf. (Sura 11, v. 9). As a creator he works not as man works, «We created the heavens and the earth and whatever is between them, in six days, and no weariness affected us.» (Sura 50, v. 37).

He is not only creator of all things, but ruler of all things, and protector as well. «It is he who causeth you to sleep by night, and knoweth what ye merit by day; he also awaketh you therein, that the prefixed term of your lives may be fulfilled. . . . He is supreme over his servants, and sendeth his guardian angels to watch over you, until, when death overtaketh one of you, our messengers cause him to die; and they will not neglect our commands. . . . Say, who delivereth you from the darkness of the land, and of the sea, when ye call upon him humbly and in private, saying ‘verily, if thou deliver us from these dangers, we will surely be thankful.’ Say, God delivereth you from them and from every grief of mind.» (Sura 6, v.). His care is always assured to those who follow his way. «Say, my Lord hath commanded me to observe justice; therefore set your face to pray at every place of worship, and call upon him, approving unto him the sincerity of your religion. . . . A part of mankind hath he directed.» (Sura 7, 28). «Whoever therefore shall deny Tagut (error) and believe in God, he shall surely take hold on a strong handle, which shall not be broken; God is he who heareth and seeth. God is the patron of those who believe; he shall lead them out of darkness into light.» (Sura 2, v. 257).

Though he is the ruler of all things and may do as seemeth good in his sight, yet is he a just God, and punishes only where punishment is due. «We will appoint just balances for the day of resurrection; neither shall any soul be injured at all; although the merit or guilt of an action be of the weight of a grain of mustard seed only, we will produce it publicly; and there will be sufficient accountants with us.» (Sura 21, v. 48). Those who suffer have gone astray or are being prepared for better things. «Every soul shall taste of death; and we will prove you with evil and with good, for a trial of you.» (Sura 21, v. 36). Of those sorely tried it is said: «I have this day rewarded them, for that they suffered the injuries ye offered them, with patience; verily they enjoy great felicity.» (Sura 23, 113). As he is a just God, every creature is responsible to Him, and must answer for his choice of good or bad, «Did ye think that we had created you in sport, and that ye should not be brought again before us? . . . whoever, together with the true God, shall invoke another god, concerning whom he hath no demonstrative proof, shall surely be brought to an account for the same before his Lord.» (Ibid. v. 117).

Though God is just, he is also merciful. «We do not lay upon any soul more than it can bear.» (Sura 6, v. 153). Like the God of the Hebrews he puts off the evil day in the hope that man may repent. «If God should punish men for their iniquity, he would not leave on the earth any moving thing; but he giveth them respite unto an appointed time.» (Sura 16, v. 163).

God's absolute decree is a separate article (the sixth) of Iman. Everything that has happened or that will happen has been already lxed by God. «Say, nothing shall befall us, but what God has decreed for us.» (Sura 9, v. 51). «No soul can die unless by the permission of God, according to what is written in the book containing the determination of things.» (Sura 3, v. 141. «He hath formed his creatures; and . . . determined them to various ends, and directed them to attain the same.» (Sura 87, v. 2). Mohammed was no theologian, however, so there arose no question about God's decree and man's free will. His attitude to the question may be shown by a quotation from sura 4, v. 80: «If good befall them they say it is from God; but if evil befall them, they say; this is from thee, O Mohammed: Say, all is from God; but what aileth these people that they are so far from understanding what is said unto them? Whatever good befalleth thee, O man, it is from God; and whatever evil befalleth thee, it is from thyself.»

There is one more aspect of the Moslem's belief in God that must not be neglected. It is the most important attribute of the deity, and its statement is found in sura 112: «Say, God is one God; the eternal God; he begetteth not, neither is he begotten; and there is not anyone like unto him.» In sura 19, v. 91, we read: «They say, the Merciful has begotten issue. Now have ye uttered an impious thing.» In Islam there is no Trinity; there is no Fatherhood; God has taken to himself no son; but is alone in his glory and power. Christ, to the Moslem, is a prophet. He was the word of God «conveyed into Mary.» Islam, failing utterly to grasp the significance of Christ's life, could not accept the idea of his crucifixion. They have therefore found an end that they deem more worthy of a prophet, and in the Koran we read that one in the likeness of Christ was crucified.

Joined to the statement of the first great truth of Islam, «There is no god but God,» is another statement considered by Moslems to be just as important;-«and Mohammed is the envoy of God.» Concerning his divine mission, Islam knows no doubt. He was the last and the greatest of all the prophets — «The seal of the Prophets.» Of prophets, thousands are recognized by Islam; but there are six, only, deemed great enough to be the holder of a title; they are Adam, Noah, Abraham, Moses, Jesus and Mohammed. As a prophet, Mohammed announced himself to the world when he first recited the 96th sura: «Read in the name of thy Lord who hath created all things.» He never claimed to be more than the envoy or prophet of God, and as such only is he reverenced by the intelligent Moslem. His tomb at Medina is an object of veneration to the Moslem world and should be visited by every pilgrim. His intercession may be asked in prayer; for he was the friend of God. Five times every day Islam testifies to its faith in God and its veneration for the prophet. Every Moslem must believe in revelation, «that which is sent down.» (Sura 2, v. 3). Beginning from earliest times, there have been numerous revelations, each of which was a law for mankind, till superseded by the next. So each of the six prophets mentioned was the recipient of a revelation. Mohammed's revelation, the Koran, is the only one not to be abrogated. It is distinctly the Word of God as revealed to Mohammed and is on a higher plane than the Traditions or inspired sayings of the prophet. It was inscribed on tablets in heaven from eternity. From time to time portions of it were given to Mohammed by the angel Gabriel.

The Moslem must believe, furthermore, in angels, of whom there are great numbers. They were created long before the world was and are of a finer material. Every believer has two recording angels; one for his good, the other for his bad deeds. The angels are charged with intercession for mankind. Certain angels preside over hell. Two important angels are Munkar and Nakir. There are four archangels: Gabriel, the angel of Revelation; Michael, the patron of the Israelites; Izrafel, who, on the last day, will blow the trumpet, and Azrael, the angel of death. Besides these angels there are the ginn, good and bad spirits, in whom Mohammed believed. Sura 72 states that a band of them once passed Mohammed and paused to listen to him. What they heard caused them to exclaim: «Verily, we have heard a marvelous discourse.» Some of them are believers in Islam and perform all the duties that devolve upon the true believer. They may assume various forms and are so numerous that the pious Moslem, in performing the most trivial act, such as building a fire, is apt to exclaim «with your permission, ye blessed.» By many it is believed that all ginn are to be destroyed on the last day; others believe there is to be a special place, outside of paradise, where such as have been believers may dwell.

In the immortality of the soul, resurrection, judgment, paradise and hell, the Moslem believes most firmly. During the first night after death, the soul remains with the body, so that it may be questioned by the two angels Munkar and Nakir. It is a question as to whether the Koran refers to this belief or not; but nevertheless it is fixed in Islam. When the angels have finished their examination, they depart, leaving the believer in peace; the wicked in torment. This is the Moslem Hades. In Sura 23, v. 99, speaking of unbelievers who have died, it is said: «Behind them shall be a bar until the day of resurrection.» The word translated by Sale «bar» is the Arabic *barzach,* and is explained by the native commentators as a partition between the living and the day of judgment, or as an intervening state between death and judgment. Generally speaking, it denotes the state of the departed soul and must be entered by all. When the trumpet is blown on the last day all must appear. Mention of this day is very often made in the Koran, especially in the earlier suras. It is the one subject of suras 75, 81, 82, 83 and 84. On this day all actions shall be weighed. "Those whose balances shall be heavy with good works shall be happy; but those whose balances shall be light are those who shall lose their souls and shall remain in hell forever." (Sura 23, v. 104). This great day the coming of which is known to God alone, is to be ushered in by certain signs, divided into the "lesser" and the "greater." Of the former there are eight, such as decay of faith, turmoils, wars, etc.; of the latter there are 16, the sun will rise in the west; the Antichrist will appear; Jesus is to come to earth, embrace Islam and slay the Antichrist. The last trial of this day is to be the crossing of the bridge Sirat, finer than a hair and sharper than a sword. Still, the believer shall cross in safety while the wicked fall to the gulf below. Should any who have professed Islam, yet lived wicked lives, be consigned to hell, they are not to remain there forever; but will be gradually purified and released. To the Moslem, hell is for the followers of other religions.

In paradise the Moslem is to enjoy all those things which to the mind of the desert Arab seemed most desirable. Here are gardens, trees ever green, rivers ever flowing, beautiful maidens, appetites that, so far from being satiated, increase as the delights are enjoyed. Here, too, he shall always see the face of (his) God and praise him, to whose mercy he owes his bliss; for his works alone are not enough to assure him entrance.

Islam is not, however, a religion of faith only; for there are certain institutions, constituting Din, or religious practice, the performance of which is obligatory. Prayer, almsgiving, fasting and the pilgrimage are duties that tax the Moslem to no small degree. Prayers are to be made to God five times every day, and are to be made with the utmost decorum. Preparatory to these prayers there are certain ceremonies of purification, consisting of ablution, either partial or covering the entire body; for the idea of an unclean person in the presence of God is intolerable to the Moslem. To facilitate these ablutions, every mosque is provided with a tank, whence issue many small streams of water. Should the worshiper be praying where there is no water, he may use sand or dust. As he ends this ceremony he is to testify that "There is no god but Allah, and Mohammed is his envoy," following this by reciting sura 97. Should the worshiper be conscious that he is clean, he may omit the ceremony. He then assumes a certain position, facing Mecca, and states softly that he intends to perform so many inclinations, following this by reciting the first sura. After this other expressions of praise are used. Though prayer is frequently mentioned in the Koran, the five periods at which it is enjoined are nowhere mentioned together. These periods are morning, noon, afternoon, sunset and night. The approach of these hours is heralded by the muezzin, who, ascending the minaret of the mosque, cries out: "Allah is most great (four times); I testify that there is no god but Allah (twice); I testify that Mohammed is the envoy of Allah (twice); come to prayer (twice); come to security (twice); Allah is most great (twice); there is no god but Allah." Prayers may be said wherever the believer happens to be at the time; but on Friday they should be said at the mosque, where a sermon is also delivered.

Almsgiving is a very important duty in Islam. The Koran makes frequent mention of it, enjoining it in most emphatic terms. "O true believers, bestow alms of the good things which ye have gained, and of that which we have produced for you out of the earth, and choose not the bad thereof to give it in alms, such as ye would not accept yourself." (Sura 2, v. 269). "If ye make your alms to appear, it is well; but if ye conceal them and give them unto the poor, this will be better for you, and will atone for your sins." (Ibid. 272). How Mohammed considered alms may be seen from several passages of the Traditions, as quoted by Hughes: "Your smiling in your brother's face is alms; assisting the blind is alms." The Koran distinguishes between legal and voluntary alms; but this distinction has been done away with to a great extent. The necessity of giving, however, remains and alms are given regularly by those who neglect many of the other duties. In the early days of Islam legal alms were collected by officials appointed for that purpose; but their bestowal now is left to the individual conscience.

Fasting was considered of great importance by Mohammed, as thereby atonement might be made, and at the present day many who neglect their daily prayers perform all the duties of the fast. The month of Ramadan was chosen for the great fast, because in it revelation came to Mohammed. Throughout this month, during the entire day, drinking, eating, smoking and many other indulgences are forbidden. When night comes, however, restrictions are removed till the next day. This fast is very severe when it falls in summer (the year being lunar, each month passes through all the seasons) and many exemptions are provided for those unable to undertake its arduous duties. Other fasts, meritorious, but not obligatory, are also in favor with Moslems. The object of these fasts is not altogether concerned with the mortification of the body; the heart is to fast; it must abstain from worldly matters and commune with God.

Once at least in his lifetime the Moslem must make the pilgrimage to Mecca. "We appointed the holy house of Mecca to be a place of resort for mankind, and a place of security; and said, Take the station of Abraham for a place of prayer; and we covenanted with Abraham and Ismael, that they should cleanse my house for those who should compass it, . . . and those who should bow down and worship there." (Sura 2, v. 119). "And it is a duty toward God, incumbent on those who are able to go thither, to visit this house." (Sura 3, v. 91). Some further regulations are found in sura 2, v. 194, and in sura 22. Trade may be indulged in while on the pilgrimage, and sura 5, v. 2, gives direction for women who contemplate the performance of this duty. When the pilgrim nears Mecca he bathes and puts on the Ihram, pilgrim's robe, and advances to the city. Here there are certain ablutions to be performed before kissing the Black Stone. He must then encircle the Caaba, the temple, seven times; kissing the Black Stone each time. After other prayers and ceremonies he must run between Mount Al-Safa and Mount Al-Marwa seven times, with stated prayers. Later he must visit the Valley of Mina and Mount Arafat where more prayers are performed. On the 10th day he proceeds to Mina and casts stones at three pillars which are set up there, seven stones at each. After this very ancient custom there is a sacrifice which ends the pilgrimage. The pilgrim may then be shaved and resume his usual clothing. He should, however, visit Medina and do homage at the tomb of Mohammed.

Though not reckoned as one of the pillars of Islam, still the obligation to wage holy wars has been so firmly held that it deserves mention here. In early days every Moslem looked forward to a world-wide conquest and by means of these holy wars expected to bring all countries under the banners of Islam. To a conquered country the terms were: Embrace Islam, pay tribute or die. These were harsh terms, but much of their severity is accounted for by the early history of Islam. Broken oaths of allegiance and unprovoked attacks are responsible, to a large extent, for Mohammed's uncompromising attitude. The Koran does state itself clearly on this point, yet no precept found there, when «taken with its context, can justify unprovoked war.». At the present day a far more liberal policy is preached toward unbelievers and the subject is much debated by the learned in Islam.

Among the prohibitions of the Koran, the most important are those concerning wine and gambling. «They will ask thee concerning wine and lots; answer in both there is great sin and also some things of use unto men; but their sinfulness is greater than their use,» and suras 2, v. 216; 5, v. 92, treat of the same. These verses are held by the Moslem to be an absolute prohibition. There might be, however, some doubt as to that if the verses alone and not their traditional interpretation were considered. Another prohibition of the Koran is murder. When one believer kills another intentionally he is to remain in hell forever. (Sura 4, v. 96). From this fate, however, popular belief rescues him. Should the killing be by accident, there are certain expiations that may be made. There are also many prohibitions in regard to eating, the most important of which is that in regard to swine-flesh. (Sura 5, v. 4). Such flesh as is eaten must be from an animal killed in a prescribed manner. Laws of marriage, divorce, testaments and many other civil and criminal laws are founded on the Koran and the Traditions. Mohammed founded not only a religion but a social system as well, wherein the religious and the political life are inseparable. This is the unique feature of Islam.

Mohammed is said to have told his followers that after him 73 sects would arise. His prophecy has been more than fulfilled. It is impossible to give more than a synopsis of a few of the more important divisions of Islam. The two great divisions of sectarian Islam are the Sunnites and the Shiites. Compared with the Sunnite, the Shiite is a small sect, numbering about 15,000,000, while the former has about 145,000,000 adherents. The Shiites believe Ali to have been the legitimate Caliph or Imam, that is, successor of Mohammed, and consequently reject Abu-Bekr, Omar and Othman. Ali, by his double relationship with the Prophet — he was cousin and son-in-law — as well as by reasons deduced from the Koran, and by traditions assigning him the appointment at the hands of Mohammed himself, should have been Imam. When Omar died, Ali was offered the succession, but as he could not satisfy his opponents that he would rule in accord with their wish he did not receive it till the death of Othman. Ali, however, was soon murdered and his son Hasan abdicated in favor of Muawiyah on condition that he might resume his office at Muawiyah's death. Yazid, however, cheated Hasan of his rights and here starts the Shiite schism. They profess allegiance to a line of 12 Imams, beginning with Ali and ending with Al Mahdi, who disappeared, but is to return. In the meantime they receive religious and legal decisions from a class of learned men, called Mudgtahids, a class of authorities not recognized by the Sunnites except in the case of the founders of the four orthodox Sunnite schools. There are numerous subdivisions of the Shiites, but on certain points they agree. The Shiites also observe the ceremonies of Moharram in commemoration of Hasan and Hosein, who were sons of Ali and were both murdered. Their memories are sacred to the Shiites. They differ from the Sunnites in that they credit the fire worshipers with the possession of an inspired book or revelation. In the ritual and civil laws also many differences are found. They have a large collection of traditions, a fact often ignored by scholars, misled by the Sunnites' claim to be the Traditionists par excellence.

The Sunnites acknowledge the first four caliphs to have been the rightful successors of Mohammed. They are divided into four orthodox sects or legal schools, the first of which was founded by Abu Hanifa. This Abu Hanifa was a pupil of the sixth Imam of the Shiites; but separated from him to form the school of his name that now predominates in Turkey, central Asia and northern India. The second of these schools, that of Ash Shafia, prevails in southern India and Egypt. The third school, that of Malik, has its home in Morocco and Barbary. The last school, that of Ahmed ibn-Hanbal, is found in East Arabia and portions of Africa. The term *Sunni,* which they apply to themselves, is an arrogant title. It signifies «one who is on the path.» They claim that they receive the six authentic books of tradition.

From the school of Ahmed ibn-Hanbal sprang the sect of the Wahhabites, who are named after their founder's father, the founder himself being named Mohammed. This Mohammed, born in Arabia, in the early part of the 18th century, having seen, in the course of his travels, that Islam had departed from its primitive faith, determined to restore to the religion of Mohammed its early purity. His zeal as a reformer received some temporary setback and he soon became the warrior-prophet. Many converts were made by his missionaries and the movement grew till Turkey feared for her own safety. In 1803 Mecca, and a year later Medina, was captured. The political power of the Wahhabites was soon destroyed, however, though the principles are still a force in Islam. In India, too, the movement met with a similar fate.

The tenets of the Wahhabites are, practically, those held by the early Moslem. They arrogated to themselves the name of Unitarians, stigmatizing other Moslems as polytheists, inasmuch as the doctrine of the eternity of the

Koran meant two eternal beings, therefore, two gods. The reverence paid to saints and their tombs aroused to a high degree the antagonism of the Wahhabites. Even the tomb of Mohammed receives no reverence from them, and when they captured Medina, all the rich ornaments were stripped from this sacred spot.

Early in the history of Islam there arose a set of free-thinkers, whose theories are held at the present day. They are known as the Mutazalites and were founded by a Persian, Wasil ibn-Ata, who separated from the school of Hasan al-Basri. The Mutazalites hold that man is the governing factor in his own acts, and is perfectly free to choose; predestination being thus abolished from their tenets. They deny the eternity of the Koran, as well as the attributes of God, believing that each attribute would be a separate, eternal quality, and that, therefore, the unity of God would be destroyed.

Mokanna, «the veiled,» is an interesting figure in the history of Islam, owing to his appearance in Moore's ‹Lalla Rookh.› This fanatic proclaimed himself God incarnate and taught that religion consisted in faith, not works. He sent out many missionaries and quite a force collected under his banners. At the advent, however, of the caliph's forces, which were sent to crush him, he deserted his followers and finally committed suicide to escape capture. Persian and Indian sources are responsible for many of his doctrines. He had secret followers for many centuries after his death.

Hasan ibn-Sabah, founder of the order of the Assassins, is a figure well known in history, owing to his connection with the Crusaders. He was at first an adherent of another sect and taught the doctrines of that sect throughout Arabia and Persia; but having won the confidence of a powerful prince, he gained possession of a fortress in Persia. Here he constituted himself grand-master of an order with a large number of minor officials, repudiated many of the tenets of his sect and began to preach religious devotion and political assassinations. His followers were many throughout Syria and Persia and he soon announced himself as al-Mahdi, repudiated the Koran, and with it all moral laws. Under the title «Old Man of the Mountain,» he became a terror not only to the Crusader, but to the Turk as well. They were finally overthrown. «Of these sects there are still scattered remnants in Syria and India, and as late as 1866 an English judge at Bombay had to decide a case of disputed succession according to the law of the Assassins.»

There is a sect of Mystics in Islam known as the Sufis. They are Moslem in name only, for they deny the necessity of religion, though they admit that its practice is useful as a guide. Their chief doctrine is entirely pantheistic. God is all and is in all, consequently there is no good, no evil, only God. The only occupation of the Sufi is meditation, constant meditation; for by this he is made ready to return to God when his soul is released from captivity. They are divided into numerous sects, some of them believing themselves simply inspired of God, others believing themselves unified with God. Their belief, they claim, has always been professed. It obtained its chief hold in Persia, where it has stirred up much trouble. Though banished in 1797, «the whole country has been so undermined by this insidious heresy that it can almost be said that Persia, throughout its whole extent, contains no real Moslem.»

A few words may be added in regard to Islam's hope of a Messiah, Al-Mahdi, «the guided one.» He is to come to restore the glory and power of Islam, and has been foretold by Mohammed, in many traditions. According to the Sunnites, he is still to come; but the Shiites believe he has already appeared in the person of the 12th Imam, who having disappeared for a time is to return. Many have announced themselves as the promised Mahdi. One, after proclaiming himself in 1881 as Mahdi and founding in the eastern Sudan his empire, was overthrown at Omdurman in 1898 by an Anglo-Egyptian army.

Mention must be made of Babism, of which Behaism is the latest development. In the year 1844, Ali Mohammed, in Persia, announced himself as the *Bab,* or «gate,» that is, «the source through which revelation comes.» As the inaugurator of a new dispensation, he set about the reformation of men's lives. Many converts were made and the antagonism of their Moslem neighbors was aroused. Thousands of adherents to the new faith were slain, and in 1850 the Bab himself met this fate. As persecution continued many fled from Persia and finally settled at Akka. In this band of exiles was one upon whom the Bab had conferred the title of Bha Allah, that is, «the Glory of God.» His declaration that he was the manifestation foretold by the Bab was accepted, and his followers have been styled Beha'is. At his death in 1892, his son, Abbas Effendi, succeeded him and is considered as the third of the divine messengers. The thousands of converts made by this new movement attest its importance. Its missionaries have made converts by thousands. Here, in the United States, its adherents are scattered throughout a few of the larger cities, and Professor Browne, the eminent English authority on Babism, speaking of its influence, states that the number and influence of the Babis in Persia is immensely greater than it was a few years ago. See BABISM; KORAN; MECCA; MEDINA; MOHAMMED; SHIITES; SUNNA; WAHABI; and consult works referred to under these articles.

Bibliography.— Ameer, Ali, ‹The Life and Teachings of Mohammed› (London 1891), a defense of Islam by an educated Moslem; id., ‹Short History of the Saracens› (1899); Arnold, T. W., ‹The Preaching of Islam: A History of the Propagation of the Muslim Faith› (2d ed., London 1913); Atterbury, ‹Islam in Africa› (New York 1899); Bahadur, Ahmed Khan, ‹A Series of Essays on the Life of Mahomet and Subjects Subsidiary thereto› (London 1870); Becker, C. H. «The Expansion of the Saracens,» in ‹Cambridge Mediæval History› (Vol. II, Cambridge 1913); Blunt, ‹The Future of Islam› (London 1880); Boer, T. J. de, ‹Geschicte der Philosophie im Islam› (Stuttgart 1901; Eng. trans., London 1903); Burckhardt, ‹Travels in Arabia› (1829); Burton, ‹Pilgrimage›; Carra de Vaux, Bernard, ‹Le Mahometisme› (Paris 1898); De Castries, ‹L'Islam› (5th ed., Paris 1912); Deutsch, E. O. M., ‹Essay on Islam› (London 1874); Dozy, R. P. A., ‹Het Islamisme› (Leyden 1863; French trans., Paris 1879); Forget, D. A., ‹L'Islam et le Christianisme dans l'Afrique centrale› (Berlin 1900); Geiger, ‹Was Hat Mohammed aus dem Judenthum aufgenommen?› (Bonn 1833; Eng. trans., London 1899); Goldziher, Ignaz, ‹Die Religion des Islams› (2d ed., Berlin 1913); Grimme, Hubert, ‹Mohammed: Die weltgeschichtliche Bedentung Arabiens› (Munich 1904); Haines, ‹Islam as a Missionary Religion› (1889); Hartmann, Martin, ‹Der islamische Orient› (Berlin 1899); id., ‹Islam, Mission, Politik› (Leipzig 1912); id., ‹Fünf Vorträge über den Islam› (ib. 1912); Hauri, J., ‹Der Islam in seinem Einfluss auf das Leben seiner Bekenner› (Leyden 1881); Hogarth, ‹The Penetration of Arabia› (London 1905); Houdas, O., ‹L'Islamisme› (Paris 1904); Hughes, T. P., ‹A Dictionary of Islam› (London 1885); Jansen, H., ‹Verbreitung des Islams› (Friedrichshagen 1897); Kremer, A. von, ‹Geschichte der herrschenden Ideen des Islam› (Leipzig 1868); Lane, E. W., ‹The Manners and Customs of the Modern Egyptians› (London 1836 et seq.); id., ‹Selections from the Koran› (ib. 1843); Le Chatelier, ‹L'Islamisme au 19e siècle› (Paris 1889); id., ‹L'Islamisme dans l'Afrique occidentale› (Paris 1899); Macdonald, D. B., ‹Development of Muslim Theology, Jurisprudence, and Constitutional Theory› (New York 1903); Müller, August, ‹Der Islam im Morgen-und Abendlande› (Berlin 1887); Margolionth, D. S., ‹Mohammed and the Rise of Islam› (London 1905); Pischon, C. N., ‹Der Einfluss des Islam auf das häusliche, sociale, und politische Leben seiner Bekenner› (Leipzig 1881); Poole, ‹Studies in a Mosque› (London 1883); Sachau, ‹Muhammedanisches Recht nach schafütischer Lehre› (Stuttgart 1897); Smith, ‹Mohammed and Mohammedanism› (1874); Vambéry, Armin, ‹Der Islam im 19ten Jahrhundert› (Leipzig 1875); id., ‹Western Culture in Eastern Lands› (New York 1906); Zwemer, S. M., ‹Arabia› (2d ed., ib. 1912).

MOHAVE (mō-hä'vā) **DESERT,** California, an arid basin chiefly in San Bernardino County, in the southeast, and also extending into Arizona, and forming part of the great Colorado Desert with which its name is frequently used synonymously. The Mohave River rising in the San Bernardino Mountains flows through it for some distance, finally disappearing in the Mohave Sink.

MOHAVE, or MOJAVE, INDIANS, an American tribe formerly the most populous and warlike of the Yuma family, residing in Arizona and California in the region of the Colorado River, between the Needles (the origin of their name) and the entrance to Black Canyon. They practised tattooing and cremated their dead. There are upward of 1,500 Mohaves remaining, most of whom live on the Colorado River Reservation in Arizona. They are an agricultural people, rank high physically and are expert makers of pottery and baskets.

MOHAWK, a river whose head-waters rise in Mohawk Hill in the southern part of Lewis County, N. Y. It flows south to Rome, where east by south, with many curves, it continues to the Hudson River, which it enters at Cohoes, nine miles above Albany. It is about 160 miles long, and is the largest tributary of the Hudson. In several places along the route there are rapids and falls, as at Little Falls in Herkimer County, Oriskany in Oneida County, and several other places, all of which are noted for manufacturing. The falls of the Mohawk River (Cohoes Falls) 70 feet high are near Cohoes, where in a glacial pot hole the complete skeleton of a mastodon was discovered in 1883. The bed of the Mohawk River was once much wider than the present channel through which the water passes; in some places the distances between the old banks are from a mile to nearly three miles. The Mohawk Valley is noted for its beauty and the fertility of its soil. The Erie Canal (q.v.) is parallel with the river to Rome. Two railroads parallel the river to Rome, the New York Central and Hudson River and the West Shore. The manufacturing industries of the valley, which depend largely for motive power upon the water power of the Mohawk, are extensive. A number of pretty villages and thriving manufacturing towns are on its banks, chief of which from west to east are Rome and Utica in Oneida County; Ilion, Herkimer and Little Falls in Herkimer County; Fort Plain, Canajoharie, Fonda and Amsterdam in Montgomery County; Schenectady in Schenectady County and Mechanicville in Saratoga County.

In the «Settlement Period» of the United States, this valley was the main highway from the «East Colonies» to the Great Lakes. It was the home of the most warlike tribes of Indians, the headquarters of the Five Nations. The first missionaries and the first explorers who left the Hudson River in this part of the United States journeyed along the country through which flowed the Mohawk. In this valley, near the Mohawk, Goupil was killed by the Indians, and later Father Jogues (q.v.) was martyred at the place now called Auriesville, on the south side of the river a little east of Fonda. Sir William Johnson built two homes in this valley, one at Fort Johnson about one mile west of Amsterdam, now the railroad station of Akin, the other, Johnson Hall, near the present Johnstown in Fulton County. Much of the early history of the river and valley as related to the whites is connected with the rule of Sir William Johnson and his power over the Five Nations. The centre of wealth and power, in the valley before the war, was at Johnson's home. At the breaking out of the Revolutionary War, an effort was made by both parties to hold possession of the Mohawk. The death of Sir William Johnson, just at the beginning of the war, removed a strong power from the council. His sons and their friends lacked his humanity and wisdom. The union between the British and the Indians resulted in many terrible scenes, among others the massacres of Cherry Creek and Schoharie, the burning of homes and the taking of many lives in the valley. Burgoyne (q.v.) realized the value of having possession of this valley, and some of the important battles of the Revolution took place along the Mohawk. There were many Tories in the valley; but a large number of the settlers were always patriots. When the news of Concord and Lexington reached the inhabitants along the Mohawk, many of them loaded into wagons all the grain they could spare and sent the precious cargoes over the rough roads to Boston. When the British determined to end the war the Mohawk Valley, the gateway to the West, was the site chosen.

Here the Tories outnumbered the patriots, and the Indians were the allies of the British; but Saint Leger's defeat at Oriskany by men under Nicholas Herkimer filled Burgoyne with despair and fired the enthusiasm and enlivened the hope of the patriots.

MOHAWKITE. An arsenical ore of copper with minor amounts of nickel and cobalt, a variety of domeykite. Occurs in Mohawk copper mines, Houghton County, Mich.

MOHAWKS, a tribe of North American Indian, the easternmost of the Six Nations, named collectively by the French, the Iroquois. According to their own tradition, confirmed by those of other tribes, they were the eldest people in the confederacy of the Six Nations and styled themselves Kaniengehaga, «people of the place of the flint.» They believed that they were liberated from subterranean confinement by Tareya-wagon, who guided them into the valley of the Mohawk; thence they passed to the Hudson and to the sea. The valley in which they at first established themselves was the seat of their power from the discovery of the country until the American Revolution. Their dominion extended from Lake Champlain to the head-waters of the Susquehanna and the Delaware. A warlike tribe, they inflicted great tortures on their prisoners and practised cannibalism. With the introduction of firearms by Dutch traders they became renowned above all the other nations for their skill as warriors, and carried terror wherever they went. Their forays extended as far as the Connecticut River, and their influence prevailed among the small independent tribes about the region of the present city of New York. During the French and Indian War they supported Sir William Johnson, following him in his most perilous expeditions and aiding him in the contests of Lake George and Niagara. After his death they transferred their attachment to his family, and were forced to flee from their ancestral home to Canada, where lands were assigned them on the Grand River and on the Bay of Quinté, near the east end of Lake Ontario, where over 1,200 still reside. See Iroquois League; Six Nations.

MOHEGAN (mō-hē'gạn) or **MONHEGAN** (mŏn-hē'gạn) **INDIANS,** a tribe of North American Indians of the Algonquian family, who formerly lived on the Thames River in eastern Connecticut. They were at one time united with the Pequots and after the death of Sassacus, the Pequot leader, the remainder of the tribe came to the camp of the Mohegan chief. After the death of King Philip in 1676, the Mohegan tribe was the only important one in that region. They became scattered, some joining the Brotherton Indians in New York. The survivors of this race are so mixed with negro and white blood that they have practically lost their identity; about 100 of them continue to reside in the neighborhood of Mohegan or Norwich, Conn.

MOHILEV, mō-hō-lĕf', Russia, a western town and government. The town and capital of the government is on both banks of the Dnieper, 85 miles southwest of Smolensk. The town has spacious streets and a large octagonal square occupied by the principal buildings, among others the palace of the Greek archbishop and the bazaar. It is surrounded by ramparts and is fortified by a citadel on a commanding height. The staple manufacture is tobacco; and the trade with Riga, Memel, Danzig, and Odessa, chiefly in leather, wax, honey, potash, oil and grain, is very extensive. Pop. 72,500, about half Jews. The government, bounded north by Vitebsk, east by Smolensk, southeast by Oreal, south by Czernigov, and west by Minsk, is about 210 miles long from north to south by 112 miles broad, and has an area of about 18,514 square miles. The surface, though in the line of watershed which divides Europe into two great basins, is generally flat, and sends its waters chiefly to the South Dwina, but partly also to the Dnieper. The soil is fertile, though very imperfectly cultivated, and the forests, chiefly of oak and fir, cover extensive tracts. The principal mineral is bog iron ore. Both trade and manufactures are limited. Pop. 2,551,400.

Another Mohilev in the government of Podolia on the left bank of the Dniester, 60 miles east-southeast of Kamenetz, has a population of 32,604, nearly half being Jews.

MOHL, mōl, **Julius von,** German orientalist: b. Stuttgart, 25 Oct. 1800; d. Paris, 3 Jan. 1876. He studied theology at Tübingen and England, and Oriental languages at Paris, becoming assistant professor of Oriental literature (1826) at Tübingen. After several years' research at Paris, London and Oxford, he was appointed by the French government to translate and publish 'Shâhnâme' by Firdosi, which appeared (Paris 1838–66) in six folio volumes de luxe. In 1847 he was appointed professor of Persian at the College de France and, in 1852, inspector of Oriental works in the Imperial printing bureau, becoming secretary and later president of the Asiatic Society at Paris. He published 'Lettres de Mr. Botta sur les découvertes a Khorsabad' (1845), concerning Botta's excavations at Nineveh. He wrote also 'Fragments relatifs à la religion de Zoroaster' (Paris 1829), in collaboration with Olshausen. His reports to the Asiatic Society were collectively published after his death by his widow (née Miss Mary Clark) under the title 'Vingt-sept ans d'histoire des études orientales' (1879–80). Consult Simpson, 'Julius and Mary Mohl; letters and recollections' (London 1887).

MÖHLER, mė'lĕr, **Johann Adam,** German Roman Catholic theologian: b. Igersheim, Würtemberg, 6 May 1796; d. Munich, 12 April 1838. He studied theology at Tübingen and became successively tutor (1822), extraordinary professor (1826), and ordinary professor (1828) at that university, and in 1835 was called to a chair in Munich. He was an able doctrinal disputant, distinguished alike intellectually and spiritually; and did much to arouse the German Roman Catholic Church to new vigor. He wrote 'Unity of the Church' (1825); 'Athanasius the Great' (1827); 'Symbolism, or Exposition of the Doctrinal Differences between Protestants and Catholics' (1832; English version by Robertson), and (a reply to the works of Baur and others against his 'Symbolism'), in 1834 'New Investigations on the Doctrinal Differences between Catholics and Protestants.' He was one of the great theologians of the century. Consult the biographies in German by Friedrich (1894) and Knöpfler (1896).

MOHLER, John Frederick, American physicist: b. Boiling Springs, Pa., 30 Oct. 1864. He studied at Dickinson College, Pa., receiving the degree A.M. (1890), and was given the degree Ph.D. (1897) at Johns Hopkins. He was appointed instructor of mathematics and science at the academies of Wilmington and Dover (1887–90), instructor of mathematics at Wilbraham, Mass. (1890–94), and professor of physics at Dickinson College since 1896. His research work extended to surface tension of water, electric arc effects on wave-length disturbance of light rays and on light spectra of magnesium. He wrote ‘Practical Physics,’ (1897) which has passed through three editons, as well as a number of scientific contributions to the periodicals.

MOHN, mōn, **Henrik,** Norwegian meteorologist: b. Bergen, 15 May 1835. He studied at Christiania and was appointed (1861) observer at the astronomical observatory of the university, becoming (1866) professor at the university, then director of the Meteorological Institute of Christiania, which was founded through his active work. He directed a scientific expedition (1876–78) in northern Norwegian waters, and the Bossekop meteorological station was erected (1882–83) under his direction as well as other stations in northern Europe. He wrote ‘Grundzüge der Meteorologie’ (Berlin 1875; 5th ed., 1898), a very important work; ‘Température de la mer entre l'Irelande, l'Écosse et la Norvège’ (Christiania 1870); ‘Oversigt over Norges Klimatologi’ (ib. 1870); ‘The North Ocean, its depths, temperature and circulation’ (1887); ‘Meteorology: Report of the Second Norwegian Arctic Expedition in the *Fram*, 1898–1902’ (1907). He has also edited, since 1867, the *Yearbook of the Norwegian Meteorological Institute.*

MOHOCKS, mō-hŏks, **The,** a club in London, England, also known as the Mohawk Club, which had a scandalous existence in 1711–12. «The avowed design of their institution was mischief»; it was composed of young men of good families, and their conduct varied from horseplay to brutalities. Gay mentions in ‘Trivia’ that the Mohawks rolled women in hogsheads down Snow-hill, and Swift told Stella of a report that 80 of them had been put into prison; while Lady Wentworth, writing to her son, Lord Strafford, says, «I am very much frightened with the fyer, but much more with a gang of devils that call themselves Mohocks.» A royal proclamation was issued against them 18 March 1712.

MOHR, mōr, **Charles Theodor,** American botanist: b. Esslingen, Germany, 28 Dec. 1824; d. Asheville, N. C., 1901. He was educated at the Polytechnic School in Stuttgart and in 1845 visited Dutch Guiana in the interest of botany. He removed to the United States in 1848 and in the following year went to California, where his health becoming impaired he returned to the East, engaging in the drug business in Louisville, Ky., and later in Mobile, Ala. He was employed in various botanical and forestry investigations under the State and United States governments. In 1884 he was appointed botanist of the Alabama Geological Survey and in 1889 became agent of the forestry division of the United States Department of Agriculture. He was a member of numerous learned and scientific societies, a contributor to the *National Herbarium* and published ‘The Timber Pines of Southern United States’ (1896–97); ‘Plant Life of Alabama’ (1901), etc.

MOHR, one of the larger of the West African gazelles (*Gazella mohr*), notable especially as the source of the «mohr-stones,» or bezoars, derived from these animals and highly esteemed by the Arabs of Morocco and Algeria.

MOHS, Friedrich, frēd'rĭн mōs, German mineralogist: b. Gernrode 1773; d. Agardo, Lombardy, 29 Sept. 1839. He studies at Halle and the mining academy at Freiberg; in 1811 became professor of mineralogy at Grätz, and later held similar posts at Freiberg and Vienna. He is known as the inventor of a new system of classification for minerals, which regards, in the collecting of species into higher groups, only their external characteristics. He published ‘Die Charaktere der Klassen, Ordnungen Geschlechter und Arten oder Charakteristik des naturhistorischen Mineralsystems’ (1820); ‘Grundriss der Mineralogie’ (1822–24, in English 1825), etc.

MOIDORE, moi'dōr (from the Portuguese, *mœda d'ouro,* literally, coin of gold), a gold coin formerly used in Portugal (from 1690–1722), worth about $6.50.

MOIRE, mwär, a French name for watered silks. Though made in the same way as ordinary silks, these are of double width and must be of a stout substantial make. They should also be folded in such a way that the air contained between the folds should not be able to escape easily. They are subjected to an enormous pressure, of from 60 to 100 tons, generally in a hydraulic machine, and the air, in trying to escape, drives before it the small quantity of moisture that is used, and hence is effected the permanent marking called watering, which is for the most part in curious waved lines. The finest kinds of watered silks are known as *moires antiques.* Woolen fabrics to which the same process has been applied are called *moreen.*

MOISE, Penina, American poet: b. Charleston, S. C., 23 April 1797; d. Charleston, 13 Sept. 1880. A personality of much charm, she was born of French parents of Hebrew extraction, who originally came from the island of Saint Eustatius. Her poetical gifts were early evidenced and her contributions to the press of her day were many, the chief of which appear in ‘Fancy's Sketch-Book’ (Charleston 1833.) Her hymn book, written for the Charleston Beth Elohin Congregation, is still utilized, and was a pioneer in its field. Despite blindness in her later years, she continued to write poems, and her home was a place of pilgrimage to a host of admirers.

MOISSAN, Henri, French chemist: b. Paris, 28 Sept. 1852; d. 20 Feb. 1907. He was educated at the Museum of Natural History in Paris and at the School of Pharmacy; taught in the Higher School of Pharmacy 1879–83, and then (1886) became its professor of toxicology. He isolated and liquefied fluorine, thus winning in 1887 the Lacaze prize from the Academy of Sciences; was transferred to the chair of mineral chemistry in the School of Pharmacy in 1889 and to that of general chemistry in the Sorbonne in 1900. He won great fame by his important experiments and achievements with the electric furnace. In 1892 he made the manufacture of acetylene simple and commercially profitable by his discovery that if carbon and lime be fused in the electric furnace pure calcium will be formed, which makes the liberation of acetylene an easy matter. Much more spectacular was his formation of artificial diamonds in 1893; iron was melted in the electric furnace and saturated with carbon; the furnace at a temperature of more than 4000° C. (that is, more than 7200° F.) was plunged into cold water; the resulting ingot was attacked with hot aqua regia; the iron was thus dissolved and artificial diamonds were disclosed. In 1906 he received the Nobel prize in chemistry. Moissan wrote ‹L'Isolement de fluor› (1886); ‹Reproduction du diamant› (1893); ‹Etude complète des carbones amorphes et des graphites› (1898), and ‹Classification des éléments› (1904).

MOISTURE. See Rain.

MOJI, mō′jē, Japan, seaport town on the most northerly point of the Japanese island Kiushiu in the Strait of Shimonoseki and opposite the harbor of that name. It is important as the shipping point of the coal obtained from the neighboring mines. The total of exports and imports in 1913 had grown to a value of over $19,500,000 and nearly $10,500,000 respectively, more extensive, therefore, than those of Noigasaki. The exports, besides coal, consist of cotton thread and cotton goods, cement, rice, porcelain wares and wood. In imports the chief articles are raw cotton, beans, grain, flour, sugar, metal ware, machinery and petroleum. Pop. 55,682.

MOKADDASI, mŏk′ạ-dä-sē, Arabian geographer: b. Jerusalem, 946. His name is derived from his birthplace and signifies merely «of Jerusalem.» He was well educated, and after a pilgrimage to Mecca in 965 devoted himself to travel. His critical sense makes his work the most trustworthy by any Mohammedan geographer. Two editions of it were published in his lifetime; it was edited by De Goeje in 1877, and the part relating to Syria and Palestine appeared in an English version by Le Strange in 1886. Consult Le Strange, ‹Palestine Under the Moslems› (1890).

MOKANNA, mō-kän′nạ, **Al** (Hakim-ben-Allah), styled the «Veiled Prophet,» Mohammedan impostor of the 8th century. He hid his face under a veil, a proceeding which his followers ascribed to the splendor of his countenance. He attributed to himself divine powers, and is said, by means of his chemical and other knowledge, to have performed apparent wonders. He gained many followers, so that at last the Caliph Mahdi was compelled to send an armed force against him. He retired to a fortress in Transoxiana, where he first poisoned his soldiers and then burned himself. His followers continued to pay him divine honors after his death. He is the hero of Moore's ‹Veiled Prophet of Khorassan› in the first part of ‹Lalla Rookh› (1817).

MOKI, mō′kē, or **HOPI,** a Pueblo tribe of Shoshonean Indians inhabiting six pueblos on a reserve of 2,472,000 acres in northeast Arizona. They are mesa-dwellers, their seven villages, chief of which are Walpi and Oraibi, being situated upon three mesas difficult of access, several hundreds of feet above the desert lands around. The inhabitants of the small village of Hano are of Tanoan stock and speak a different language, being descendants of refugees from the Rio Grande who migrated in 1680 at the time of the Pueblo rebellion. They became first known to the whites (Spaniards) in 1540. The Moki are small in stature, but muscular and agile. They are of an industrious and provident nature, successful cultivators, keeping their granaries always well stocked with agricultural produce, and are devoting increased attention to pasturage; they are also noted for their manufactures of pottery, baskets and blankets and for their woodcarving. They numbered, in 1904, 1,878 persons, are monogamists, and are descendants of tribes who according to the evidence of the ruins scattered around have inhabited the region for several generations. They are ruled by a council of hereditary clan elders and the chief of the religious fraternities, and are rich in mythology and folklore.

MOLA, Pietro Francesco, Italian painter: b. Coldre, near Como, 1612; d. Rome, 13 May 1668. At an early age he went to Rome, where he studied painting under Prospero d'Orsi and Giuseppe Cavaliere d'Arpino. He afterward painted at Venice, Milan and Bologna, in which last city he adopted the style of the local painters, especially Albani. His landscapes are of special excellence. The English National Gallery possesses his ‹St. John Preaching in the Wilderness› and ‹The Repose of the Holy Family in the Flight into Egypt.› In the Ravenna chapel of the Church of Jesus at Rome is his ‹Peter in Prison› and in fresco ‹The Return of Peter to Rome.› He also painted the ‹History of Joseph› in the Quirinal Palace. Others of his works are to be seen in the Louvre, the Pinakothek at Munich and the Dresden Gallery. He was one of the followers of Annibale Caracci, whose manner he reproduced with ease and dexterity, but he was lacking in imaginative depth, while his indebtedness to Albani and Guercino is too evident.

MOLA DI BARI, mō′lạ dē bä′rē, Italy, town in the province and district of Bari, on the Adriatic Sea and on the Bari-Brindisi Railway. It has a church of the Norman period, a gymnasium, harbor, oil-presses and tanneries. Pop. 14,911.

MOLASSES. See Sugar.

MOLASSES ACT. See Acts of Trade.

MOLAY, Jacques Bernard de, zhäk bār-När de mō-lā, French knight-templar, last master of that order: b. Burgundy, about 1243; d. Paris, 11 March 1314. He entered the Order of the Templars in 1265 and became its grand master in 1298. In 1306, after the Templars had been driven from Palestine, and while he was in Cyprus busied about raising new troops against the Saracens, he was summoned to France by Pope Clement V, who was determined to end the feuds between the Templars and the Knights of Saint John. Philip the Fair, fearing, it is alleged, the power of the order in France, seized Molay and all the knights then resident in France, after receiving them with the greatest kindness, charged the order with heresy, tried them before a packed court and found them guilty. Molay was imprisoned and terribly ill-used for more than five years, then, after recanting certain admissions of guilt he had made, was burned at the stake. The guilt of the Templars is still a disputed historical question. Consult Prutz, ‹Entwicklung und Untergang des Tempelherrenordens› (1888), Lea, H. C., ‹History of the Inquisition› (Vol. III).

MOLDAU, mŏl'dow, a river of Bohemia, which rises in the Schwarzberg, on the frontiers of Bavaria, flows first southeast to Rosenburg, where it turns almost due north, and continuing that direction, in a circuitous course, passes Budweis. After receiving several tributaries it traverses the town of Prague, and after turning due east, joins the Elbe on the left, 17 miles north of Prague. Its whole course is about 270 miles. It begins to be navigable at Rosenburg, where its north course commences, but at first only for shallow barges.

MOLDAVIA, mŏl'dā'vĭ-ạ, Rumania, a northern division of the kingdom since 1861 (area, 14,759 square miles; pop. about 2,145,-464), when the union of the former principalities of Wallachia and Moldavia as the Principality of Rumania was proclaimed. See RUMANIA.

MOLDENKE, mōl'dĕn'kė, **Charles Edward,** American Egyptologist: b. Lyck, East Prussia, 10 Oct. 1860. He was graduated from Columbia in 1879, and from the University of Strassburg in 1885. He was ordained to the Lutheran ministry in the latter year and held pastorates successively in Jersey City, N. J., 1885–90; New York, 1890–96; Mount Vernon, N. Y., 1897–1900. He has published ‹The Egyptian Origin of Our Alphabet› (1886); ‹The Trees of Ancient Egypt› (1886); ‹The New York Obelisk› (1891); ‹The Tale of the Two Brothers› (1898); ‹Egyptian Classics› (1900).

MOLÉ, Louis Matthieu, loo-ē mät-tē-ė mō-lā, French statesman: b. Paris, 1584; d. there, 3 Jan. 1656. His integrity and fearlessness often resisted the arbitrary measures of the despotic Richelieu, and under the no less ambitious but less vigorous Mazarin, he acquired the esteem of all parties. In 1641 he was appointed first president of the Parlement through the influence of Richelieu, whom he had opposed in the process against the Marshal de Marillac. The disturbances of the Fronde soon after commenced. In this contest of factions Molé defended with equal prudence and sagacity the interests of justice and freedom, as well as those of the court, and when Paris became the theatre of tumults, conducted himself with so much firmness and dignity that his bitterest enemies could not withhold from him their approbation; and even Condé and Cardinal De Retz were forced to esteem him, although his unshaken rectitude and devotion to the welfare of the nation and the safety of the throne frequently frustrated their designs. He was more than once threatened with personal violence by the furious partisans of the Fronde, whom he overawed by his inflexible dignity. In the memoirs of De Retz and other records of the time of the regency of Anne of Austria and Mazarin, Molé's happy influence in the troubled state is everywhere perceptible. His ‹Memoirs,› bearing on the stirring events in which he acted so great a part, were published in 1855.

MOLE, a small insectivorous mammal of the family *Talpidæ*. They are related to the still smaller shrews (*Soricidæ*), from which the typical species may be distinguished by having the external ears so short that they are completely concealed in the fur, the fore feet broad and shovel-like, the skull provided with an auditory bulla and a zygomatic arch, minute eyes and other characters. The moderate number of species, belonging to 11 genera, are found only in the temperate portions of the northern hemisphere. Three species, the common mole (*Scalops aquaticus*), the hairy-tailed mole (*Parascalops breweri*) and the star-nosed mole (*Condylura cristata*) occur in the eastern United States. The fourth genus (*Scapanus*), with six species, is confined to the Pacific coast. The second is the smallest and is also distinguished by its densely hairy tail and numerous teeth. It is not common and is found chiefly in mountains and about evergreen forests. The star-nosed mole is known at once by the rosette of fleshy processes on the snout and its larger size; both it and the common mole are abundant in cultivated lands and pastures, the former preferring moist, the latter dry lands. Their habits differ only in details. Moles are eminently fossorial — a mode of life for which they are by structure peculiarly adapted. They construct underground nests lined with soft grasses, from which several passages run off in different directions, and by branching become finally divided into a network of burrows which daily enlarges as the animal searches for the earthworms and insects on which it almost exclusively feeds. They seldom come to the surface except just at noon — a habit which has been repeatedly observed but never explained. The young are born in the nest and some species raise two broods. Notwithstanding its scientific name the common mole shuns water while the star-nosed mole shows a decided predilection for its vicinity and is an expert swimmer. Consult Stone and Cram, ‹American Animals› (1903).

MOLE, a long pier or breakwater built of masonry and extending into the sea, at times to a distance of a mile or more. In San Francisco Bay are two of these piers, the Oakland Mole and Alameda Mole. The railroad extends to the end of these moles and connects with a line of ferry-boats.

MOLE. See NÆVUS.

MOLE CRICKET. This insect (*Gryllotalpa vulgaris*) is most appropriately named, for it combines the characteristics of the crickets, to whose family it belongs, with some of the habits and special adaptations of the moles. The mole-crickets dig winding burrows in the loose soil on the borders of ponds and ditches, raising ridges like miniature mole-hills. In their subterranean wanderings they cut the roots of plants, upon which, as well as upon earthworms and larvæ, they feed. A Porto Rican species (see Changa) does serious damage to crops. The European mole cricket lays several hundred eggs in an underground chamber where they are guarded by the female, though many of the young are later devoured by the male. The species occurring in the eastern United States are *Gryllotapa boreais* and *G. longipennis*. They may be recognized by their large brown bodies with a velvet-like covering of fine, close hair, short wing covers and fossorial front legs, not unlike the great paws of a mole. The ear of the mole cricket is situated on the front leg below the knee. Two pairs of wings are found, the tegmina or upper wings which are small, and the larger true wings which are long, delicate and flexible.

MOLECH. See Moloch.

MOLECULAR THEORY, in physics and chemistry, the theory which teaches that matter, however homogeneous it may appear to be, is in reality a heterogeneous aggregate of ultramicroscopic particles called «molecules.» In a crude form this idea was entertained and defended, even before the Christian era, by certain of the philosophers of Greece and Rome, among whom Democritus and Lucretius may be specially mentioned. The writings of these ancient authorities are of great interest to the historian, and are highly creditable when allowance is made for the state of science at the time they were produced; but they are too nebulous to be of practical value to the modern physicist, who demands that every theory shall be tested by a critical comparison of its necessary consequences with the facts of observation.

The distinction between the atomic theory and the molecular theory, though still convenient for many purposes, is nevertheless an artificial one, which will doubtless disappear in time. The atomic theory relates to the view that the chemist takes with regard to the constitution of matter, while the molecular theory relates to the point of view of the physicist. The atom has been the ultimate unit in which the chemist has been interested, while the molecule has been, until the very recent past, the ultimate unit with which the physicist has concerned himself. The chemist has dealt mainly with the phenomena of chemical combination, as observed when two or more definite substances unite so as to produce one or more new substances, and to him it has not been essential to speculate with regard to the physical nature of the tiny particles that constitute his fundamental units, nor with regard to their behavior except as it concerns the chemical phenomena that he observes in his test-tubes and other apparatus. The physicist, on the other hand, has paid but little attention to the facts of chemical combination, but has confined his attention chiefly to the mechanical, thermal, electrical and magnetic phenomena that are observed in connection with definite substances whose chemical constitution remains unchanged, and to him the molecule has been a small, physical body, possessing mass and extension, movchanics. The modern corpuscular theory of treatment in accordance with the laws of mechanics. The modern corpuscular theory of matter, however, promises to do a great deal to bring the physical and chemical viewpoints far closer together, and perhaps even to bridge wholly the gap between them. (See Electron Theory or Corpuscular Theory). There is much evidence, already, to indicate that the «affinity» that chemical substances have for one another is of an electrical character; and when the physicist has arrived at a more definite knowledge of the ultimate nature of electricity, it is possible (and even probable) that this knowledge will go far to clear up the mysteries of chemical affinity, and to consolidate chemistry and physics into a single science.

The molecular theory in its present form may be said to be a development of the 19th century; for although the celebrated Swiss mathematician, Daniel Bernouilli, had suggested, in the 17th century, that gases consist of little molecules moving freely about among themselves, and that gaseous pressure is due to the collisions of these molecules with the walls of the containing vessels, and although other thinkers had made analogous suggestions which helped to prepare the way for the modern theory, it was the work of John Dalton, in chemistry, which gave the first great impetus to the molecular theory, by making it, in some form or other, almost a necessity of thought. Dalton showed (1805) that when substances combine chemically, they do so in certain definite proportions; and he concluded that the facts of this sort which he amassed could be best explained by assuming that matter consists of exceedingly minute particles, or «atoms,» each of which has a definite weight, and that when bodies combine chemically, their atoms come together in pairs, or in threes, or fours, or in other combinations involving only integral numbers, according to the compound formed. (See Atomic Theory). It was shortly afterward observed that when gases combine they do so in accordance with certain simple volumetric laws. One volume of hydrogen, for example, combines with one volume of chlorine, to form two volumes of hydrochloric acid gas; and two volumes of hydrogen combine with one volume of oxygen to form approximately two volumes of steam-gas. To bring facts of this sort into harmony with Dalton's theory, it was suggested by Avogadro in 1811, and independently by Ampère in 1813, that all gases, when under the same conditions of temperature and pressure, contain the same number of molecules per unit of volume. With these tangible evidences of the molecular structure of matter as an incentive, physicists and chemists set themselves the task of testing, in all conceivable ways, the consequences of such a theory; and in the course of a century of experimental and mathematical study, no fact has been discovered which tends to controvert the fundamental doctrine that matter has a molecular structure. The molecular theory, in some form, is, therefore, confidently believed to be true by practically all physicists and chemists. The observations which have been made, and which must be harmonized and explained by the molecular theory, are so numerous and so varied, however, that no single set of mutually consistent hypotheses about the nature of molecules has yet been proposed, which completely and demonstrably explains everything that is known about matter.

It is quite probable that our progress in the development of the molecular theory has been seriously handicapped by our natural reluctance to throw overboard, when dealing with ultramicroscopical bodies, conceptions at which we have arrived by studying larger bodies upon which we can experiment, or the behavior of which we can directly observe. Many indications of this are already apparent. For example, the principle of relativity (if further study proves it to be sound) will oblige us to substitute new mechanical axioms (or postulates) for those of Newton, in many lines of investigation; and we already recognize that when we have to deal with matter moving at extreme velocities (1) we can no longer assume mass to be constant, and (2) we have to distinguish between longitudinal and transverse mass, because the behavior of the body with respect to an impressed force is different, according as the force acts parallel to the velocity or at right angles thereto. (See ELECTRON THEORY). In dealing with molecular and sub-molecular bodies and magnitudes, there is no logical reason why we may not make any assumptions whatsoever that prove to be convenient,— provided these assumptions, when the bodies to which they are applied are large and tangible, harmonize with the facts of experience in the world that we can see; and when this fact is fully appreciated, and we have wholly abandoned the attempt to make the behavior of individual molecules and corpuscules harmonize with conceptions we have formed from a study of the larger facts of nature, our progress will doubtless be much more rapid. But until we have found out the precise set of assumptions that will best account for the ultramicroscopic phenomena of the universe, we shall perforce continue to treat the molecule as though it obeyed Newton's laws of motion, except in certain special cases or aspects, where we may know that it does not; and in the transitional stage that science is now entering, we shall be further vexed by having to deal with incompatible assumptions to a large extent, and to explain certain phenomena in accordance with our older conceptions, while at the same time we apply newer and broader conceptions to other closely related phenomena.

It has been abundantly proved that the «atom» of the chemist and the «molecule» of the physicist are (in general) different things, a molecule being a system formed by the union of a definite number of atoms, combined in a definite way. The molecules of a given substance are the smallest parts into which that substance can be conceived to be divided, without changing its chemical character; while the atoms are the proximate constituents through whose immediate combination the molecule is formed. (The word «proximate» is employed here, because the atoms themselves are now believed to be composed, wholly or in part, of still smaller corpuscles, as will be explained subsequently). The molecules of most of the substances that are considered in elementary inorganic chemistry are comparatively simple in structure. Hydrochloric acid gas, for example, is composed of molecules which each contain one atom of hydrogen combined with one atom of chlorine, as indicated by the formula HCl; and water (at least in the form of steam-gas) is composed of molecules which each contain one atom of oxygen combined with two atoms of hydrogen, as indicated by the formula H_2O. In organic chemistry molecules occur which apparently contain hundreds of constituent atoms, and the comparative stability of such systems is hard to understand, on any hypothesis.

One of the most fundamental assumptions of the molecular theory in its usual form is that the molecules of any one chemical substance are identically alike in all respects. This point was tested by Graham, in the case of hydrogen, by passing the gas through a series of porous partitions, and comparing the final hydrogen, as it issued from the last partition, with the original gas. No difference could be observed, and hence it was concluded that hydrogen, at least, is not a mixture of dissimilar particles; because it is known that a mixture of different gases, whose molecules are different in size, can be partially separated by a diffusion process of this kind. Stas, the great Belgian chemist, investigated this question by determining the atomic weight of a given element as prepared in different ways and from different sources; and he found that the results obtained under these varying conditions were indistinguishable from one another, even when his work was so accurate that a variation in the atomic weight of the hundredth part of 1 per cent could hardly escape detection. It cannot be considered to be proved, however, that the molecules of any one substance are alike in every way, in the sense that a hundred standard machine screws are alike, for the question has not yet been tested exhaustively enough. Graham's method and Stas' method furnish evidence to which proper weight should be given, but they cannot be said to be conclusive. Neither can we admit the evidence of the spectroscope to be conclusive, although it indicates that the internal vibrations of a molecule of hydrogen (for example) are performed with the same rapidity, whether the hydrogen is obtained from water, or from organic bodies, or from the gases that are occluded by meteorites and brought to us from the depths of space. The identity of molecules of the same substance is nevertheless a fundamental assumption of the usual molecular theory, and it will be assumed in the present article. In this connection the modern theory of isotopes should be considered. According to Soddy (who coined the word «isotope») it is possible, or perhaps probable, that many of the substances now considered to be homogeneous elements may prove to be heterogeneous when we know more about them. Each so-called element may consist of several different substances, which are inseparable and indistinguishable by any means we now have. Such substances are said to be «isotopic» with one another, and among the radio-active elements several such bodies have already been recognized. Ionium, thorium and radio-thorium are isotopes, for example. Consult A. W. Stewart, 'Recent Advances in Physical and Inorganic Chemistry.'

All matter may be classified, for present purposes, as (1) gaseous, (2) liquid or (3) solid. (See MATTER). According to the kinetic theory, a gas consists of molecules which are distributed through the space occupied by the gas in such a manner that the average distance from one molecule to the next one is large in comparison with the diameter of any one molecule. The molecules are all believed to be in rapid motion, so that from time to time they encounter one another; and when an encounter occurs it is believed that the molecules that come together rebound again as if they were perfectly elastic bodies. They have motions of rotation as well as of translation, and the collisions affect both the rotative and the translatory velocities of the colliding molecules. A system composed of a practically infinite number of bodies of this sort will have certain properties which are considered in the article Gases, Kinetic Theory of, and shown to be in general agreement with the properties of the actual gases of nature.

It may be shown, by the methods of the kinetic theory of gases, that the speed with which the molecules of a gas are moving may be determined by means of the formula

$$\bar{v} = \sqrt{3PV}$$

where V is the volume, in cubic centimeters, of one gramme of the gas, P is the pressure exerted by the gas, in dynes per square centimeter, and $\bar{v}$ is the square root of the average value of the *squares* of the velocities of the molecules, each expressed in centimeters per second. In the case of hydrogen at atmospheric pressure and the temperature of melting ice, we have $V = 11,160$ and $P = 1,012,000$; and therefore $\bar{v}$, for hydrogen molecules under the assumed conditions, is equal to 184,100 centimeters (or 1,841 meters) per second. The kinetic theory of gases shows that the true *average* (or arithmetic mean) of the velocities may be found by multiplying the so-called «mean-square velocity,» $\bar{v}$ (as obtained above), by the constant 0.9213. Hence the *average* velocity of the molecules of hydrogen, under the conditions here assumed, is $1,841 \times 0.9213 = 1,696$ meters (or 5,564 feet) per second. The mean (or average) velocity for any other gas, under these same conditions of temperature and pressure, may be found by dividing the velocity of the hydrogen molecules by the square root of the number that expresses the density of the other gas, when the density of hydrogen is taken as unity. Furthermore, the molecular velocity increases, in any given gas, in proportion to the square root of the absolute temperature.

The molecules of a gas undoubtedly attract one another under ordinary circumstances (except in the case of hydrogen, where the force appears to be repulsive at all distances); but it is assumed that they are so far apart during the greater part of the time that the attractive forces that exist do not have any great effect upon the motions of the system as a whole. The path of a molecule of gas, between two successive collisions, is called the «free path» of the molecule, and is believed to be sensibly straight, owing to the high velocity that the molecules have on the average, and the (assumed) fact that the attractive forces are unimportant at distances comparable in magnitude with the mean «free path.» Maxwell showed that the average free path of the molecules of a gas may be calculated by means of the simple formula

$$L = \frac{3k}{SD}$$

where L is the average free path in centimeters, k is the coefficient of viscosity of the gas in absolute measure (see Viscosity), S is the average speed with which the molecules are moving (in centimeters per second), and D is the mass of one cubic centimeter of the gas (in grammes). At atmospheric pressure and the temperature of melting ice, this formula gives values of L approximately as follows, where the unit, in each case, is the millionth part of a centimeter: Hydrogen, 17; nitrogen, 9.1; oxygen, 9.7; carbon dioxide, 6.4.

The length of the free path of a given gas is increased, when the density of the gas is diminished, in the exact inverse ratio of the change in density. In an exhausted tube containing hydrogen, for example, at a density one one-millionth of the density assumed above, the mean free path of the molecules would be a million times as great as the value given for hydrogen at the normal density — that is, the free path at this particular exhaustion would be 17 centimeters, so that the molecules would travel, on an average, over six inches between successive collisions. As the kinetic theory of gases assumes that the molecules collide with one another after traveling distances that are negligible in comparison with the dimensions of the whole mass of gas under consideration, its conclusions, when applied to gaseous masses in which this condition is not fulfilled, must be received with proper caution. Maxwell's formula, for example, is itself doubtful when applied to the extreme case in which the density of the hydrogen is only a millionth of the normal value. It is certain, however, that the free paths of gas molecules at such high exhaustions are to be measured in inches, and it is also certain that the pressure is not necessarily equal in all directions in vacua of this degree of perfection, since it is by means of the incessant collisions that this equality of pressure is brought about at ordinary densities. For these reasons (among others) Sir William Crookes considered that highly attenuated gases, in which the pressure is a millionth of an atmosphere or less, should be considered as constituting a «fourth state» of matter, essentially distinct in its properties from the three states that are commonly recognized. He also devised the radiometer and other instruments to show the reality of the difference of pressure that can exist in high vacua. In recent years it has become increasingly probable that in certain forms (at any rate) of the apparatus devised by Crookes,— in those forms, namely, in which «cathode rays» are generated by the action of powerfully excited electrodes,— the mechanical effects that are observed are not due directly to the motions of the gas molecules themselves, but rather to the motions of free electrical corpuscles given off by the gas molecules under the influence of the powerful electric discharge. Crookes himself appears to have held views not essentially different from this, though at the time they were stated they were clothed in language that was necessarily rather indefinite, since the corpuscular or electron hypothesis had not then taken form. See Electron Theory; Radiation.

In liquids, the molecules are supposed to be so near together that the attractive forces that they exert upon one another are powerful at all times. The kinetic theory of liquids is imperfectly understood, but it is considered certain that collisions occur among the molecules just as they do in gases and that the colliding molecules rebound from one another like perfectly elastic bodies. In liquids, however, there is nothing strictly analogous to the «free path» in gases; for the liquid molecules are always exposed to attractive forces of considerable magnitude and hence in the intervals between successive collisions they describe paths that are everywhere markedly curved. There is, doubtless, as great a variety of velocities among the molecules of a liquid as among those of a gas, but the law of distribution of velocities among liquid molecules has not yet been determined, on account of the mathematical difficulties that are involved and which have thus far proved insuperable. Admitting the fact that the velocities of the molecules are unequal, let us consider what would happen at a free surface of the liquid, assuming for the moment that above this free surface there is a boundless vacuum. A molecule that is well within the liquid is attracted, on the whole, equally in all directions. A molecule at the surface, however, is attracted only downward. Hence it is evident that when a molecule, in the course of its wanderings, comes to the surface, the possibility of its escape from the liquid depends upon the magnitude of the vertical component of its velocity. If this vertical component is sufficient to carry the molecule beyond the range of sensible attraction of the liquid, the molecule will pass away indefinitely into the space above. On the other hand, if the vertical component of its velocity is not sufficient to carry the molecule beyond the range of sensible attraction of the liquid, it will rise into the vacuous space only a short distance, its upward velocity growing less and less, under the influence of the downward attractive forces, until it vanishes altogether; after which the molecule will begin to fall back and it will finally plunge into the liquid again. From the slowness with which free evaporation takes place, we must conclude that by far the greater part of the molecules that start upward fall back into the liquid. Those that do escape by reason of their great velocities carry off more than their equable share of the kinetic energy of the molecules of the liquid and this causes the average kinetic energy of the liquid, per molecule, to grow continually less. In other words, free evaporation causes a reduction of the temperature of the mother liquid. When the liquid is enclosed in a containing vessel of finite volume, the phenomena are somewhat different, after the evaporation has proceeded for a time. If the space above the liquid is vacuous at the outset, the evaporation, at the first instant, takes place precisely as before. Of the molecules that come to the surface of the liquid, those that are moving most rapidly in a vertical direction fly off as in the case previously considered; but they can no longer pass away indefinitely into space. They are now retained in the vessel, in which they will accumulate, constituting a gas or vapor whose density will go on increasing until a certain limit is reached. The molecules composing this vapor will travel in every direction, precisely as they do in other gaseous bodies. Many of them, therefore, will plunge back into the liquid again and become an integral part of it once more. Now the number of molecules that leave the mother liquid in a given time will be quite independent of the density overhead; but the number that fly back into it again, in a given time, will be greater, the greater the density of the vapor. At the beginning of the evaporation the vapor will be quite rare and the number of molecules that fly off in any given time will greatly exceed the number that return during that time. The density of the vapor will, therefore, increase. After a certain interval (short as measured by ordinary standards), the density of the vapor will become so great that the number of molecules plunging back into the liquid in a given time will become sensibly equal to the number that fly off from it in the same time. When this adjustment becomes perfect, the density of the vapor will no longer increase. It is then said to be «saturated,» and its density will remain constant until the temperature of the system is altered. If the temperature be now raised, all the molecules will be accelerated and hence more molecules will plunge from the the vapor into the liquid in a given time than before, and more molecules will also come to the surface of the liquid from the interior. Furthermore, of the increased number of molecules that emerge from the interior of the liquid, a larger proportion than before will have velocities exceeding the critical velocity that a molecule must have in order to escape from the attraction of its fellows. Hence, on the whole, the density of the vapor will increase, approaching a new limit at which the number of incoming and outgoing molecules will again become equal. It follows, therefore, that for any vapor in contact with its liquid there is a definite density corresponding to each temperature. The existence of a critical point (q.v.) may be explained in a similar manner, by considering the average kinetic energy that a molecule must have in order that it may be able to pass away from the attraction of other molecules in its immediate vicinity. A stone thrown upward by the hand does not proceed far before the attractive force of the earth annuls its velocity and causes it to fall back again. A rifle will project a ball far higher, but the ball will eventually fall back, just as the stone did. With a good modern cannon we can throw a projectile several miles into the air — and still it falls back. But we might conceivably project one with such a speed that it would leave the earth forever. It may be shown, in fact, that if the retarding action of the air is omitted from consideration, an initial vertical speed of 36,700 feet per second would be quite sufficient. With this much premised, conceive two molecules of a gas to be in contact, and let a sudden impulse be given to one of them, to drive it away from the other one. If the impulse is small enough, the disturbed molecule will only travel a short distance, and will then fall back to its original position; but we may give it such a speed that the attractive force of the fixed molecule will fail to bring it back, and in this case it will travel onward indefinitely. Now, just as in the case of the cannon-ball and the earth, there must be some intermediate initial speed that will be *just sufficient* to separate the two molecules under consideration. We may call this the «critical velocity,» and we may say that if the molecules of a given gas are moving so that, on an average, when two of them collide they have a relative velocity greater than this critical value, the gas in question cannot be liquefied by pressure alone; for even if its molecules were forced almost into absolute contact with one another, their velocities would be sufficient to separate them again indefinitely, as soon as the pressure was removed. From this, and from the relation between temperature and molecular velocity in gases (see GASES, KINETIC THEORY OF), it follows that for every gas there is a temperature above which the gas cannot be liquefied by any pressure whatever.

Very little is known about the molecular constitution of solid bodies. The most obvious property of a solid is, that it preserves its shape so long as it is not acted upon by external forces. Moreover, when such forces are applied, the solid indeed becomes deformed, but it eventually regains its original shape after the forces have been removed, provided they did not exceed a certain magnitude called the «elastic limit,» which is peculiar to the solid under examination, and to the way in which the forces were applied. We are obliged to conclude, from these facts, that the molecules of a solid are not free to roam about, but that some or all of them have determinate mean positions about which they may oscillate and rotate, but from which they never permanently depart except when constrained to do so by an external force great enough to overcome the internal forces (whatever they may be) which normally determine the mean positions of the molecules. Some solids are brittle toward forces that are suddenly applied to them, although they yield slowly, and after the manner of a viscous fluid, to smaller forces that are applied continuously for a long time. A mass of cold pitch, for example, may be easily shattered by a blow, and yet when allowed to rest for a sufficient time upon an inclined plane, it yields gradually to the relatively insignificant force of gravity, loses its shape and slowly flows down the plane. It is evident that solids of this character must have exceedingly complicated structures. Maxwell suggested that they consist of two kinds of molecular groups, of which one is more stable than the other, and he supported his argument with considerable ingenuity. His views were purely speculative, however, and it appears to be fairly evident that the first advances that we make toward a good understanding of the molecular structure of solids must be based upon a study of bodies of crystalline nature, like quartz and iron.

It is certain that in crystals there is some definite regularity of orientation, either in the molecules themselves, or in their motions; and it may be fair to assume that this regularity is of such nature that any given molecule, in its vibratory excursions, never passes outside of a certain imaginary ellipsoid, which may be conceived to be described about the mean position of the molecule. Crystals may then be regarded as aggregates of such ellipsoids, piled up in such a way that the corresponding axes of all of them are either parallel throughout the mass, or at least arranged in accordance with some definite geometrical scheme. When a substance crystallizes, either from solution or from a state of fusion, the ellipsoids that bound the crystal molecules must necessarily arrange themselves so that the potential energy of the resulting solid is as small as it can be, consistently with the conditions under which the solidification takes place. For the sake of illustrating the application of the molecular theory to the explanation of crystal structure, we may assume the ellipsoids to be simple spheres, and we may also assume that the potential energy of the system is least when the spheres are grouped together as closely as possible. The problem of crystal structure is then reduced, in its geometrical aspect, to the simple one of finding out how to pack the greatest number of equal spherical balls into a given space; and in order to properly comprehend the principles that are involved, a little patient experimentation with a liberal supply of buckshot or spherical bullets is desirable. It will be found that pyramids can be built with them, apparently in several ways; though the internal structure of the pile is really the same in all cases. The slant faces of these pyramids correspond to the plane faces of the actual crystal. When a crystal is forming (say by deposition from a solution) we are to conceive that a continuous series of exchanges is going on, all over its surface. Molecules of the dissolved substance are caught by the attraction of the growing crystals, but, on the other hand, molecules of the solidified crystal are continually passing into solution again; and the gradual increase in size of the crystal is due to the fact that in a unit time more molecules are caught by it than are lost again. Suppose, now, that the surface of a partially formed crystal is injured slightly, and let us represent the injury, in our shot pile, by removing a few of the shot from one of the faces of a pyramid. A molecule that happens to lodge in the injured place will be in contact with more of the other attracting spheres than it would touch if it were to collide with one of the uninjured parts of the crystal, and it will, therefore, be held more firmly in place. In the exchange of molecules between the crystal and the solution, a molecule thus embedded will be less likely to be torn away again; and this action tends to preserve the flatness of the faces of the growing crystals, and to cause the repair of damaged places to proceed with greater rapidity than the growth along normal, uninjured parts.

In the mathematical investigation of crystalline structure it is usual to speak of crystals as possessing a «lattice-like» structure in space,—a space-lattice being defined as a numerous set of fixed points, arranged in such a way that the point-distribution is identically the same in every region. The points may be considered to be the mean positions about which the respective molecules oscillate. From the point of view of the investigator this conception has proved to be exceeding useful, but for the purpose of giving a general conception of crystal structure the idea of piled spheres or ellipsoids is perhaps simpler and clearer.

It has been said, above, that the molecules of bodies attract one another. We do not know much, however, about the mechanism by which the attraction makes itself felt, nor even about the law in accordance with which the attraction falls off with increasing distance. It would be natural to assume it to vary as the inverse square of the distance, but it is usually held that there is good evidence that it falls off more rapidly than this, as the distance increases. Maxwell assumed, in certain of his writings, that the attraction varies as the inverse fifth power of the distance, but he apparently chose this law merely because it rendered certain of his equations more manageable. William Sutherland has advanced reasons for believing that the inverse fourth power is more nearly correct for the distances that are commonest between the molecules of gases under ordinary conditions of density. We do not even know that the forces between molecules are «central,» — that is, we do know that the attractive force exerted by a molecule tends toward definite points within the substance of the molecules. Helmholtz showed, in a paper published in 1847, that if the universe consists of smooth spherical molecules, which attract one another only by forces that are directed toward their centres, the great fact of the conservation of energy is a necessary consequence (see ENERGETICS); but as we now have good reason for believing that molecules are not bodies of this sort, the principle of the conservation of energy must be regarded as a mere fact of observation. The distance at which the attractive force exerted by a molecule is still sensible is of course indefinite, depending as it does upon the delicacy of the means that are employed for the detection of the force. Maxwell showed that a soap-bubble would become unstable when its thickness is reduced until it is only equal to the radius of sensible molecular attractive power; and as Reinold and Rücker have shown that soap-films become unstable at a thickness of about one two-millionth of an inch, we may take this as a rough estimate of the limiting distance at which molecular attractive power ceases to be sensible.

The aggregate volume of all the molecules in a given mass of gas may be obtained, to a rough approximation, by several methods, among which we may mention the so-called «characteristic gas equation,» which exhibits the relation between the pressure, density and temperature of a gas. Equations of this sort have been given by Van der Waals, Clausius and others, and in them a term occurs whose value depends upon the proportion that the bulk of the actual molecules bears to the total bulk of the gas that they constitute. The numerical magnitude of this term may be determined by experiments upon the variation of the pressure of a gas with temperature and density, and hence the aggregate bulk of all the molecules may be determined in a somewhat approximate manner. Roughly, it may be said that at ordinary densities, the actual total bulk of all of the molecules of a gas is from the thousandth to the ten-thousandth part of the bulk of the entire gas.

We are still far from being able to calculate the diameter of a molecule with any degree of precision, although we have no doubt advanced considerably beyond the point at which we stood when the first edition of the Encyclopedia Americana was published, for at that time asking how big a molecule is was much like asking «How big is a crowd?» The question could be answered only in an exceedingly crude way. We now know the individual *masses* of molecules with a considerable degree of precision, as will presently be shown; but we cannot hope to be able to determine the geometrical dimensions of molecules in more than a general way, until we attain to a clearer understanding of the physical constitution of these bodies. It is conventional, at the present time, to understand, by the expression «diameter of a molecule» the diameter of the smallest sphere that can be imagined to be drawn around the molecule, consistently with the condition that nothing could collide with the molecule without penetrating this sphere. German writers have called this imaginary sphere the «Wirkungssphäre,» and French writers call it the «sphère de choc» or «sphère de protection.» Clausius and Maxwell showed that the diameter, d, of this collision-sphere may be calculated, in gaseous substances, by means of the expression

$$d^2 = \frac{1}{\pi n L \sqrt{2}},$$

where d is the diameter in centimeters, L is the mean free path in centimeters and n is the number of molecules present in each cubic centimeter. The application of this formula to actual gases gives the following values of d (Perrin):

Helium	$1.7\text{x}10^{-8}$ cm.
Argon	$2.8\text{x}10^{-8}$ cm.
Mercury vapor	$2.9\text{x}10^{-8}$ cm.
Hydrogen	$2.7\text{x}10^{-8}$ cm.
Nitrogen	$2.8\text{x}10^{-8}$ cm.
Chlorine	$4.1\text{x}10^{-8}$ cm.

These values, although admittedly crude, are probably of the right general order of magnitude. See below for determination of n.

Considerable progress has been made in the last few years in the way of determining the masses of molecules, and the number of molecules that exist in a given quantity of matter. Some of the methods that have been proposed depend more or less directly upon a knowledge of the way in which the kinetic energy of a molecular aggregation is divided or partitioned among the constituent molecules. Our present knowledge with regard to molecular kinetic energy rests on a fairly sound basis in the case of gases, but it is still largely (though not wholly) conjectural in connection with liquids and solids. To facilitate the statement of the facts indicated by the kinetic theory of gases, let us assume that in any given mass of gas there are three intersecting and mutually perpendicular straight lines drawn in fixed positions in space, and let us call these lines the axes of X, Y and Z, respectively. The X-axis, for example, may extend in a north-and-south direction and the Y-axis in an east-and-west direction. The Z-axis will then be vertical. The individual molecules will be moving in every possible direction, and with the greatest imaginable variety of speeds, but we may simplify matters somewhat by conceiving the velocity of every one of them to be resolved into three components, each parallel to one of the three fixed axes we have drawn. Then, confining our attention for the moment to a gas containing molecules of only one kind, the kinetic theory tells us that one-third of the total kinetic energy that the molecules of the gas have, in virtue of their motions of translation, will be accounted for by the components that are parallel to each of the three fixed reference axes. Furthermore, if each molecule (so far as concerns the applicability to it, as a whole, of the accepted laws of mechanics) is assumed to be a rigid, elastic body in rotation, and if the rotation of every such molecule is resolved into component rotations about axes passing through the centre of gravity of the molecule, and drawn parallel to the fixed axes of X, Y and Z, respectively, a similar statement may be made with regard to the rotational energy. Namely, one-third of the total kinetic energy represented by the rotations of the molecules will be accounted for by the component rotations about the axes that are parallel to the axis of X, and the remaining two-thirds will be accounted for by the component rotations about the axes that are parallel to the axes of Y and Z, respectively. Furthermore, the aggregate kinetic energy due to the translatory motion of the molecules in any one given direction is equal to the total kinetic energy due to the component rotations of the molecules about axes parallel to any one given direction. For the modifications to which this principle is subject when it is applied to molecules that have a number of degrees of freedom greater or less than six, reference should be made to GASES, KINETIC THEORY OF.

If the given gas contains molecules of several different kinds, then the kinetic theory teaches us (1) that the foregoing statements are true for each species of molecule, separately and independently of all the others; and (2) that the average kinetic energy of translation is identically the same in each of the several species of molecules that may be present; and furthermore, (3) that the average kinetic energy of translation, in any one set of molecules, is proportional to the absolute temperature of the gas as a whole.

The foregoing conclusions are based upon the researches of numerous mathematicians and physicists, beginning with Maxwell; but the principle of the equable partition of kinetic energy, as here described, was established, in its full generality, by Boltzmann, and is often called «Boltzmann's H theorem.» (See, in addition, Watson, ‹Kinetic Theory of Gases›). There has been considerable controversy as to the soundness of the proofs that have been given of it, yet the principle itself has been exceedingly fruitful, and it has played an important part in the development of the molecular theory in general. The consensus of opinion among physicists appear, to be, in fact, that the Boltzmann theorem, whether the proofs of it that we have are sound or not, constitutes a good general approximation to the real facts —provided we can regard molecules as behaving, in their excursions and encounters, substantially like solid and perfectly elastic bodies, which obey the same laws of mechanics that are followed by bodies large enough to be visible — and provided, furthermore, the molecules are not thrown into a state of internal vibration by reason of the shocks that they experience upon encountering one another.

It should be carefully noted, however, that even if we admit that Boltzmann's law of the partition of kinetic energy holds true in the case of a gas, it by no means follows that it is applicable to liquids and solids. In fact, certain of Boltzmann's fundamental assumptions are not fulfilled, even approximately, in liquids and solids; and hence his reasoning will not apply to such bodies, even though the conclusions at which he arrived may possibly still hold true. At first thought it appears highly improbable that molecular motions in solids and liquids will be found to conform with the principles stated above, except that for any given substance the kinetic energy due to the translatory motions parallel to the three fixed axes will probably be equally divided, as before —though it is not obvious that even this would be true, in general, in crystals. Nevertheless, there is indirect evidence that tends to show that a distribution of kinetic energy similar in a general way to that established by Boltzmann for gases prevails also in liquids and solids. The numerous useful analogies that have been observed between gases and dilute solutions are strongly suggestive of a close relation in ultimate molecular behavior between liquids and gases, and the law of Dulong and Petit is similarly suggestive in connection with the solid state.

In physical chemistry it is often convenient to deal with the so-called «gramme-molecule» (or «gramme-atom»), a gramme-molecule (or gramme-atom) of any element or compound being defined as that quantity of it that has a weight in grammes equal to the molecular weight (or atomic weight, as the case may be) of the element or compound under consideration. The convenience of this unit depends mainly upon the fact that when we measure out any two definite chemical substances in quantities proportional to their respective molecular weights, we know that each sample then contains the same number of molecules. The actual determination of this number is a separate and special problem; but even if it proved to be forever impossible to enumerate the molecules, we should nevertheless find it useful, for many purposes, to know that the number of them is the same in two given cases. Assuming the atomic weight of magnesium to be 24.32 and that of platinum to be 195.2, to obtain a gramme-atom of each we weigh out 24.32 grammes of magnesium and 195.2 of platinum. Then we know, at all events, that we have taken the same number of atoms in both cases (except for slight errors in weighing and in determining the atomic weights). Now the specific heat of magnesium is 0.250 and that of platinum is 0.032. Hence $24.32 \times 0.250 = 6.08$ calories of heat will be required to raise the temperature of the gramme-atom of magnesium by one Centigrade degree. Similarly, $195.2 \times 0.032 = 6.25$ calories will be required to raise the temperature of the gramme-atom of platinum by the same amount. The point to be specially noted is that approximately the same amount of heat is required, *per atom,* to raise the temperature of either metal by one degree; and this appears to be the ultimate significance of the law of Dulong and Petit — which states that the product of the specific heat and atomic weight of a solid chemical element has an approximately constant value. It is true that there are apparent exceptions to this rule, but it is often found that there is a marked tendency to conform to the law when the temperature of the exceptional substance is raised. The law of Dulong and Petit has been the subject of many investigations, and it has been shown to be applicable to numerous compounds as well as to the elements. «This is the case even at the ordinary temperature,» says Perrin, «for the fluorides, chlorides, bromides, iodides and sulphides of various metals, but not for oxygenated compounds. A specimen of quartz weighing 60 grammes, composed of one gramme-atom of silicon and two of oxygen (or three in all), absorbs only 10 calories per degree of rise of temperature. But above 400° C. this same fragment uniformly absorbs 18 calories per degree, or precisely 6 for each gramme-atom," which is substantially the same result as was obtained above, for magnesium and platinum at ordinary temperature.

The law of Dulong and Petit would be an immediate consequence, if we should assume (1) that the heat absorbed by the solid is all expended in accelerating the motions of translation and rotation of the molecules, (2) that the molecules of solid bodies all have the same number of degrees of freedom, (3) that the kinetic energy of translation of a molecule is the same (at any given temperature) whether the substance in which it exists is gaseous or solid, and (4) that the Boltzmann law of the partition of kinetic energy is fulfilled in solids. The first of these assumptions cannot be rigorously true either for solids or for liquids, and even in gases it is probably only closely approximate. The second assumption is also unlikely to be true of solid bodies in general, though solids may possibly be divisible into a small number of classes, in such a way that all the members of any one class will conform to it. When every reasonable allowance has been made for recognized uncertainties and sources of inaccuracy, the evidence that still remains is sufficient to suggest, as intimated above, that something akin to the Boltzmann law for gases holds true even in solids. Moreover, by making the assumption that a law of this general nature holds true in liquids, investigations have led to experimental results in good general agreement with those obtained by wholly different and totally independent methods.

Among the interesting and important results obtained by assuming that in liquids the kinetic energy of translation is distributed in accordance with the Boltzmann law those obtained by Perrin deserve conspicuous mention. (See BROWNIAN MOVEMENT). Perrin experimented with emulsions of various kinds, in which extremely small solid particles were suspended in liquids of a lesser specific gravity — extraordinary care being taken to have the particles uniform in size and as nearly spherical as possible. The most trustworthy results were obtained with gamboge or mastic, the gum being dissolved in alcohol and then precipitated by pouring the alcoholic solution into a large volume of water. Uniformity in size was assured by a careful fractional centrifugalization of the precipitated particles, while suspended in distilled water — a kilogramme of the original mastic furnishing, after several months, a fraction containing a few decigrammes of spherules of acceptable size and uniformity. The size and density of these spherules were then determined by several different methods, which gave concordant results. In the experiments that were considered by Perrin to be most reliable, the radii of the spherules were 0.367 of a micron — a micron being the thousandth part of a millimeter. Assuming that particles of this size, when suspended in a liquid, will comport themselves like molecules so far as the distribution of kinetic energy is concerned, so that the average kinetic energy of translation of the gum particles will become equal, after a time, to the average kinetic energy of translation of the molecules of the liquid in which they are suspended, it is possible to obtain, from a study of the visible particles in an emulsion, definite information respecting the invisible molecules composing the liquid in which the emulsion is suspended. Perrin made use of no less than four different methods, in endeavoring, in this way, to ascertain the number of molecules in a gramme-molecule of matter, and he gives a general account of all four in his book on atoms. Surprisingly concordant results were obtained. In his simplest method, the emulsion was allowed to stand until the suspended particles in it had attained a permanent state of distribution — a condition which could be verified by making a miscroscopic examination of the emulsion, from time to time, at certain selected points. When the final state was reached, the number of solid particles per cubic millimeter of the fluid mass was greatest at the bottom of the containing vessel, and diminished in a regular manner with increasing height. A careful study was made, by means of the microscope, of the distribution of the solid particles at different heights, and by assuming that this distribution is determined by the same laws that hold in connection with gaseous molecules, it was found to be possible to determine the number of molecules in a gramme-molecule of matter of any kind. The idea upon which this work was based is exceedingly ingenious, and consists, as will be seen, in assuming that by working with fine-grained emulsions, where we have positive and definite knowledge of the mass, size, number, motions and distribution of particles that approach molecules closely enough to be presumably governed by similar laws, we can draw accurate conclusions as to the molecules themselves. From his most trustworthy series of experiments, Perrin concluded that Avogadro's number (that is, the number of molecules in a gramme-molecule of matter) is 68.2×10^{22}. If this number be accepted as correct, it follows that the mass of hydrogen atom is 1.47×10^{-24} grammes, from which we can easily obtain the mass of the atom or molecule of any other substance, the atomic or molecular weight of which is known.

Ingenious and important as Perrin's methods and results are, it is probable that future physicists will value them mainly for the light that they throw upon molecular behavior rather than because they afford us a means of determining Avogadro's number. In fact, we already have another and probably superior determination of the number of Avogadro, made by a totally different method, and based upon assumptions fewer in number and more likely to be generally admitted. Millikan, in his admirable and classic researches, found the value of the electron to be 4.774×10^{-10} absolute electrostatic units; and as the Faraday constant (or quantity of electricity required to liberate one gramme-atom of a monovalent element by electrolysis) is known to be 9,650 absolute electromagnetic units (or $2{,}894 \times 10^{11}$ absolute electrostatic units), it follows that $(2{,}894 \times 10^{11}) \div (4.774 \times 10^{-10}) = 60.62 \times 10^{22}$ separate and individual electrons are concerned in the deposition of one gramme-atom of such an element. Hence we infer that 60.62×10^{22} is the value of Avogadro's number. This appears to be an unexceptional and exceedingly accurate method, provided we admit that one and only one electron is liberated or neutralized, for every atom of the monovalent element that is deposited,— an assumption which approaches closely to certainty, and which is far more likely to be true than are some of the assumptions that underlie other methods of determining Avogadro's number. Accepting Millikan's value of this number, it is easy to show that the mass of a hydrogen atom is 1.662×10^{-24} grammes, and that the number of molecules in one cubic centimeter of gas at 0°C. and 760 millimeters pressure, is 27,050,000,000,000,000,000. Millikan believes the probable error of his determination of the electron is only about the thousandth part of the concluded value as stated above, and if that estimate is justifiable, the values given above for Avogadro's number, for the mass of the hydrogen atom, and for the number of molecules in a cubic centimeter of gas, may be considered to be correct to the same degree of relative certainty,— that is, each may be considered subject to a probable error of the thousandth part of its own value.

Our knowledge of the constitution of the molecule, although still meagre, has been extraordinarily advanced in the last few years. In the earlier scientific treatment of the molecular theory, atoms and molecules were assumed to be hard, smooth, spherical and perfectly elastic. It is doubtful if any competent physicist really believed them to have these characteristics, but the difficulties involved in the mathematical treatment of the molecular theory were considered to be insuperable unless assumptions of the kind here indicated were made. It should be understood, however, that even although the actual molecules or atoms, if we could examine them individually and closely, might not resemble, in the least degree, the description of them thus given, yet they might behave collectively in much the same way as the spherical particles to which the mathematician found it necessary to confine his first investigations. Moreover, certain characteristics of the molecule may sometimes be accounted for by means of one set of assumptions, while certain other characteristics are best explained by the aid of an entirely different set. It is, therefore, wise to consider all the different constitutions that suggest themselves, in order to see what particular phenomena each one harmonizes with; for by doing this we may perhaps be aided in our approach to the final solution of the problem.

Rankine, following certain suggestions of Sir Humphrey Davy, developed a theory of molecular structure which he called the «hypothesis of molecular vortices» and which assumed that each fundamental atom consists of a nucleus or central point surrounded by an elastic atmosphere which is retained in position by attractive forces. He ascribed the elasticity of vapors to the centrifugal force developed in these atmospheres, which he assumed to be in a state of rapid revolution or oscillation about their central nuclei, and he believed that light is propagated through matter by means of the vibration of the central atomic nuclei, which were assumed to exert attractive or repulsive forces upon one another. (To account for the propagation of light through free space he assumed a certain special constitution for the ether, with which we are not at present concerned). From this hypothesis of molecular vortices Rankine deduced a number of the known properties of bodies, being specially successful in connection with the pressure of saturated vapors; but subsequent mathematicians and physicists did not find the hypothesis attractive or promising and his theory still remains in the condition in which he left it, although it may yet be found to be a sort of crude forerunner of the modern corpuscular theory of molecular constitution.

Lord Kelvin made the interesting suggestion that atoms are merely definite portions of the ether of space, distinguished from the remainder of the ether by being endowed with a peculiar kind of motion called «vortex motion.» The smoke rings that are sometimes seen over the stacks of locomotives afford familiar examples of vortex motion and the cyclone is another example on a grand scale. According to the principles of hydrodynamics it appears that a vortex ring, once set in motion in a frictionless fluid, would be indestructible and eternal. Moreover, it would possess certain elastic properties that are of special interest, inasmuch as perfect elasticity is one of the postulates that physicists have demanded for the atom or molecule from the very earliest times. It will be observed that the vortex theory of Kelvin does away with matter as distinct from the ether of space — the atom or molecule being distinguished from the remaining portion of the ether merely by reason of the special kind of motion with which it is endowed. Interesting as Kelvin's vortex theory is, it presents numerous difficulties that are almost insuperable as soon as we endeavor to develop it sufficiently to make it harmonize with the vast range of physical and chemical facts that we now possess.

Dr. C. V. Burton suggested, some years ago, that the atom may be simply a region in which the ether is subject to a permanent strain of some kind. This hypothesis may be capable of considerable further development, but it does not appear to harmonize with the direction in which present thought is tending. Dr. Burton's conception has the apparently unique merit of making it possible even to explain the origin of matter; for if the ether had long ago possessed motion of the most general kind, we might imagine its present condition to be due to the degeneration of that motion into a fine-grained turbulence, and if the constitution of the ether is such that strain-figures of the sort imagined by Burton are possible in it, then atoms may have resulted from time to time whenever the ether chanced to become stressed, locally, to such an extent as to take what would correspond in the world of familiar experience to a permanent set. In the vortex theory of Kelvin, an atom always consists of the same portion of ether, but in Burton's ether-strain theory it is only the *strain* that is propagated through the ether when the atom moves, the ether itself remaining motionless.

At the present time physicists strongly

favor the electrical theory of the constitution of matter. According to this view, an atom is a system composed largely or perhaps wholly of discrete charges of electricity, which maintain their individuality throughout all the changes that the atom undergoes. Much more is known about the negative charges than about the positive ones, because negative charges can easily be detached from atoms and molecules and subjected to study. The little charges or masses of electricity with which we are concerned in the investigation of molecular structure are commonly called «electrons,» but some of the best modern authorities (following the original suggestion of J. J. Thomson) prefer to speak of them as «corpuscles» when considering them as physical bodies and to use the word «electron» as the name of a unit of electricity — the quantity of electricity, namely, that each corpuscle bears or of which it perhaps wholly consists. (See ELECTRON).

According to present views, all negative corpuscles are precisely alike, no matter from what source they come. The same is believed to be true of all positive corpuscles; but the positive corpuscle is believed to be differently constituted from the negative corpuscle — notably in respect to size and mass. There is also a marked tendency toward the belief that molecules contain nothing else in addition to these positive and negative corpuscles. If this conception be correct, we are to think of matter as being composed solely of electric corpuscles, the differences between the chemical elements being merely architectural — one differing from another only in the number and arrangement of the corpuscles of which the atoms consist.

We do not know the precise way in which the atom is put together, but certain fundamental facts in relation to its structure are becoming reasonably clear. In the early days of the electrical theory, Lord Kelvin suggested that the atom might consist of a spherical charge or mass of positive electricity of considerable magnitude, with many negative corpuscles oscillating or revolving within it. If the positive charge were distributed uniformly through the sphere, it would be easy to imagine a state of things in which the oscillations or revolutions of the negative corpuscles would be performed in certain definite periods and we might thereby hope to account for spectral lines that highly-heated substances show under suitable conditions. Later investigations have indicated, however, that this conception of the atom is hardly tenable. For example, it is now considered to be quite certain that the positive electricity in the atom is limited to an exceedingly small bulk, instead of occupying a considerable part of the total volume.

It is not possible to review all the theories of molecular structure that have been proposed and considered, nor would it be desirable to do so, because many of them that were regarded with considerable favor only a few years ago have now been definitely discarded on account of their demonstrated inadequacy. Something must be said, however, of the views that are at present in favor and which have been tested well enough to indicate that they are probably steps in the right direction.

It has long been known that the apparent mass of a body is larger when the body is electrically charged than it is when there is no such charge present. The difference is too small to be observed in bodies of ordinary size, but the theory of electricity indicates that if the charge is concentrated in an exceedingly small volume, the apparent mass due to electrification may become very significant and important. Physicists now incline strongly to the view, in fact, that there is no such thing as «real mass» in the old sense of this expression, but that the mass of a body is due exclusively to the presence, within the molecules of the body, of the highly-concentrated electric charges that constitute the corpuscles of which these molescules are composed. (For discussion of electrical mass, see ELECTRON THEORY). The mass of a stationary or slowly-moving negative corpuscle has been shown to be equal to the one thousand eight hundred and forty-fifth part of the mass of a hydrogen atom. It was thought probable, a few years ago, that we should, therefore, have to assume that the hydrogen atom contains 1,845 of these corpuscles, if we are to explain its mass on the electrical basis. It is now believed, however, that the greater part of the mass of the atom is resident in the positive corpuscles that it contains, and if this be true it is no longer necessary to assume that the atom has the highly complicated structure that would be implied by the presence within it, in some form of stable arrangement, of nearly 2,000 negative corpuscles, even in the simplest case.

It appears probable, at the present time, that an atom consists of a certain number of centrally-located positive electrons, perhaps associated with an unknown number of negative corpuscles and certainly surrounded by other negative corpuscles which are in a state of rapid motion and which are related to the central nucleus in some such way as the planets of the solar system are related to the sun. Rutherford showed that the number of free positive electrons in a gold atom can be determined by observing the deflection experienced by alpha-particles (see RADIOACTIVITY) when these particles are passed through gold-foil of known thickness. The experiment was performed in Rutherford's laboratory (*Philosophical Magazine,* 1913, p. 604) and was repeated with foils composed of a number of other metals also, and it was found that, for the metals that were used, the number of free positive electrons in one atom was in each case approximately equal to half the atomic weight of the metal. This result harmonizes with the conclusions reached by Barkla from experiments of a wholly different kind; and Moseley, by his wonderful researches on the wave-lengths of X-rays, proved, beyond apparent question, that the number of free positive electrons in the nucleus of an atom is equal to the «atomic number» of the element to which the atom belongs — that is, to the number that the element bears when all the elements are arranged in accordance with the so-called periodic law. The results obtained by the methods of Rutherford and Barkla are only rough and approximate; but they substantiate Moseley's conclusions and as Moseley's results are absolutely definite and extraordinarily well founded, we may conclude that we now know, without much doubt, just how many free positive electrons the nucleus of every atom contains. The hydrogen atom for example, contains 1; carbon atom, 6; chlorine atom, 17; iron atom, 26; gold atom, 79, and uranium, 92. We do not known how these central positive corpuscles are held together, but we infer that when an atom has no free electric charge, it contains, distributed through its outer regions, freely-moving negative corpuscles equal in number to the free positive electrons in the nucleus.

If these views be sound, then it follows that no very considerable part of the mass of the atom can be accounted for by the mass of the outer negative corpuscles, because they are too few in number. If, therefore, we adhere to the view that mass is wholly electrical, it is highly probable that the mass of the atom resides mainly in the central positive corpuscles of the nucleus. As we now know the number of these, we may obtain a general estimate of their size (in accordance with the principles explained under ELECTRON), in order that they may have the required mass. It is found, in this way, that the diameter of the positive corpuscle is only about one two-thousandth of the diameter of the negative corpuscle, and as the diameter of the negative corpuscle is only about the fifty-thousandth of that of the atom, it is evident that the positive corpuscle is minute beyond conception. If an atom were magnified up to the size of the earth, the negative corpuscle would have a diameter of about 850 feet and the positive corpuscle would have a diameter of only about five inches.

It will be evident, from the data here given, that an atom is far from being a solid, impenetrable body. It is more like the solar system in constitution—its bulk being mainly occupied by space, in which a few small corpuscles are circulating. This requires us to revise our old conception of the collision of atoms and molecules. They cannot often come together in actual physical contact, because the forces of attraction and repulsion that the component corpuscles exert are exceedingly great, and atoms or molecules, as they approach contact, must, therefore, be repelled apart with great violence by the mutual actions of their exterior negatively-electrified corpuscles; though it has not yet been made entirely clear how this tendency can be consistent with the facts of chemical combination. A particle possessing sufficient kinetic energy could penetrate an atom and pass through it without sensible perturbation, unless it happened to strike the small central nucleus; and we have photographic proof that the heavy, alpha-particles with which we have to deal in the study of radioactivity can pass through no less than half a million atoms in succession, before being stopped or sensibly deflected.

The electrical theory of the constitution of matter is still confronted by certain serious fundamental difficulties, notwithstanding its numerous successes. One of the most formidable of these difficulties is concerned with radiation. Electrical theory indicates, for example, that an electron must radiate energy whenever its motion is changed, either in speed or in direction. An electron revolving with uniform speed in a circular orbit would, therefore, radiate energy continuously. Unless we are prepared to abandon the principle of the conservation of energy or can show that atoms are continuously supplied with energy from some external source, it is hard to escape from the conclusion that atoms are all «running down.» In some cases, indeed, we have evidence that this is true. The radioactive elements, for example, are undergoing gradual spontaneous decomposition, but that is apparently due to the fact that the particular arrangements of electrons that prevail in their atoms are not altogether stable. It is no part of our present problem to consider whether this indicates that after a time the radioactive elements will disappear forever, or whether there is some unrecognized agency at work, renewing them, so that the supply will be maintained substantially as at present. It is important for us to note, however, that most of the matter with which we commonly have to deal is composed of elements that show radioactivity either very slightly or not at all; and hence we must recognize that the atoms of what may be called the «commonplace» elements are apparently stable, except as they are modified within certain limits by electrification, chemical combination or some other external influence.

In view of the difficulty just suggested, it has been assumed, by some of the leading physicists of the past few years, that the deduction that has been drawn from the theory of electricity, to the effect that an electron must radiate energy in consequence of a mere change in the *direction* of its motion, is (for some unknown reason) unsound and that radiation occurs only when the *speed* of the electron changes. A certain amount of indirect evidence in favor of this view is afforded by the phenomenon of permanent magnetism, which is not necessarily attended by the radiation of energy, although it is convenient to consider the magnetization to be due to the orientation of the orbits of some (or all) of the outer negative corpuscles in the atoms of the magnet. Apparently we here have a case in which the corpuscular revolutions continue indefinitely, without loss of energy by radiation.

Bohr has had marked success in accounting for radiation phenomena by assuming (1) there is no radiation from a corpuscle that is moving with uniform speed, even when the path it follows is curved; (2) that although the negative corpuscles in the outer parts of an atom normally revolve in circular orbits suggestive of those followed by the planets in the solar system, yet they may (and do) pass somewhat abruptly from one of these orbits to another; (3) that radiation from a corpuscle takes place only while the corpuscle is making a change of this kind in its orbit; and (4) that the possible stable orbits are not infinite in number, but that each stable orbit is characterized by the possession, by the corpuscle following it, of a quantity of kinetic energy expressed by ½ Ihn, where I is any integer, h is Planck's constant (see RADIATION) and n is the number of orbital revolutions that the corpuscle makes per second. By means of his theory, Bohr is enabled to account for all the spectral lines of hydrogen with a wonderful degree of precision. The same high degree of precision is not obtained when the theory is applied to other elements, though the agreement is still close enough to be strongly suggestive. In fairness to Bohr's theory we should remember that it was originally proposed in connection with the simple case in which the atom consists of a single negative corpuscle, revolving about a single free positive nucleus. That may very likely be the actual constitution of the hydrogen atom, and hence we should expect the most accurate correspondence with the facts in that case. When the atom contains a larger number of free positive and negative electrons, the fields of force that they produce will naturally overlap to a large extent and it is possible that some portion of the inaccuracy of the Bohr theory, when applied to elements other than hydrogen, may be due to this cause.

See also ATOMIC THEORY; BROWNIAN MOVEMENT; ELECTRON THEORY OR CORPUSCULAR THEORY; GASES, KINETIC THEORY OF; RADIATION; RADIOACTIVITY; X-RAYS; ZEEMAN EFFECT. For a general popular review of the older form of the molecular theory, consult Risteen, 'Molecules and the Molecular Theory of Matter.' For the beginnings of the electrical views, consult also Thomson, J. J., 'Electricity and Matter'; for later developments Comstock and Troland, 'The Nature of Matter and Electricity'; Perrin, 'Les Atomes' (now also available in an English translation); Millikan, 'The Electron'; Stewart, A. W., 'Recent Advances in Physical and Inorganic Chemistry.'

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MOLESKIN, a fabric so called from its being soft like the skin of a mole. It is a strong twilled cotton fabric, cropped or shorn before dyeing. In the United States the word is also applied to the padded breeches worn by football players.

MOLESWORTH, mōlz'wĕrth, SIR **Guilford Lindsey**, English civil engineer: b. Milbrook, Hampshire, 3 May 1828. He studied at King's School, Canterbury, and at the Putney College of Civil Engineers; was apprentice to the chief engineer of the London and Northwestern Railway; was employed at Woolwich Arsenal during the Crimean War; went to Ceylon 1859, becoming director-general of railways there in 1867, and in 1871 was appointed consulting engineer to the government of India. He received decorations for his services in the Afghan and Burma wars and retired in 1889. He was president of the Institute of Civil Engineers 1904. He wrote a standard 'Pocket-Book of Engineering Formulæ,' various other works on technical subjects, 'Imperialism in India' (1885); 'Reason and Instinct in Ants' (1886); a prize essay, 'Silver and Gold' (1891); 'Our Empire under Protection and Free Trade'; 'Economic and Fiscal Facts and Fallacies' (1909).

MOLESWORTH, Mary Louisa Stewart, English writer: b. Holland, 1842; d. 21 July 1921. In 1861 she was married to Major Molesworth of the Royal Dragoons. Her earlier writings were novels under the pen-name «Ennis Graham»; she wrote her first children's stories about 1875 and gained an immediate success. Her most famous titles are 'Carrots' (1876); 'The Green Casket' (1890); 'Meg Langholme' (1897); 'The Laurel Walk' (1898); 'The Grim House' (1899); 'This and That'; 'The House that Grew' and 'Peterkin.' Among her later novels are 'Hathercourt Rectory'; 'The Red Grange' and 'Fairies Afield.'

MOLESWORTH, SIR **William**, English politician: b. London, England, 23 May 1810; d. there, 22 Oct. 1855. In 1823 he succeeded as 8th baronet; studied at Edinburgh and Cambridge, but was obliged to leave the latter because of his having challenged a tutor to a duel, and completed his education in Germany. He was a member of Parliament for East Cornwall 1832–37, for Leeds 1837–41 and for Southwark from 1845 till his death. In 1853 he became first commissioner of public works under the Earl of Aberdeen, and in 1855 was colonial secretary under Palmerston. The close friend of Bentham and James Mill, he was looked upon as the parliamentary exponent of the «philosophical Radicals.» He founded the *London Review* in 1835 and the next year merged it in the *Westminster Review*. Consult Fawcett, M. G., 'Life of Sir William Molesworth' (London 1901).

MOLFETTA, mŏl-fĕt'tä, Italy, a seaport city in the province of Bari, on the Adriatic, 15 miles northwest of the city of Bari. It has a magnificent Romanesque cathedral of the 12th century; several other churches; a college; manufactures of linen and saltpetre; a harbor, well-sheltered except on the north, and a considerable trade in corn, oil and fruit. Pop. 43,263.

MOLIÈRE, mō-lē-ār (assumed name of JEAN BAPTISTE POCQUELIN, zhŏṅ bä-tēst pŏk-ĕ-lăṅ), French dramatist: b. Paris, 15 Jan. 1622; d. there, 17 Feb. 1673. His father was *valet de chambre* and upholsterer to the king. When his father had become debilitated he had to discharge his office about the person of Louis XIII. In 1641 he accompanied the king to Narbonne. The French theatre had at that time begun to flourish through the talents of the great Corneille, and young Pocquelin, who had imbibed a strong passion for the stage, now formed a company of young persons of similar tastes, exchanged his family name for that of *Molière*, and resigned the office of his father. His company soon became distinguished; and we find him at the head of a strolling troop, which acted 'L'Etourdi' at Lyons probably in 1653. This is the first comedy written in verse by Molière. The truth of the dialogue, the inexhaustible skill of a valet continually employed in rectifying the blunders of his master, the interest of the situations arising therefrom, have kept this piece on the stage notwithstanding the want of connection between the parts. Molière gained equal applause as a poet and an actor, and drew all the spectators from another company at Lyons. The art of representing character and manners on the comic stage was reserved for Molière. 'L'Etourdi' was acted with equal applause in Béziers. Here the Prince of Conti, who had known Molière at school, had just assembled the estates of Languedoc. He received the poet as a friend, and entrusted him with the charge of amusing the town and the assembly. 'Le dépit amoureux' (1656) and 'Les précieuses ridicules' (1659) were brought forward in the theatre of Béziers. In 'Le dépit amoureux' the incidents are better arranged than in 'L'Etourdi.' In the actions of the personages a genuine comic vein is exhibited, and their language displays much spirit and humor; but the plot is too complicated, and the *dénouement* not sufficiently probable. The plot in the ‘Précieuses ridicules’ is more simple. A delicate satire on the prevailing affectation of the character of *bel esprit* and of a romantic style, on the pedantry of learned females, and affectation in language, thoughts and dress, is the object of this comedy. It produced a general reform after it was brought out in Paris. The spectators laughed, recognized themselves, and applauded. Louis XIV, well pleased with the performances of Molière's company, made it his own company, and gave its director a pension of 1,000 livres. ‘Sganarelle’ appeared in 1660. This piece also contains a fund of sportive humor, and keeps the spectators continually amused. Censure was not silent on its appearance, but was not listened to. ‘Don Garcie de Navarre’ (1661), in imitation of the Spanish, was criticized with more justice. It is a cold attempt at a more elevated style. ‘L'Ecole des maris’ (1661) the idea of which is drawn from the ‘Adelphi’ of Terence, contains a simple and entertaining plot and a natural *dénouement*. The theatre still resounded with the applause with which this piece was received, when ‘Les fâcheux’ (1661), projected, executed and committed to memory by the actors within a fortnight, was performed at Vaux at the residence of Fouquet, intendant of finances, in the presence of the king and court. This comedy is almost destitute of plot, but the intention was to interest the spectators by the multiplicity of characters, the truth of the portraits, and by the elegance of the language. It is said that the king, on going away from the first performance, happening to see the Count Soyecourt, a tiresome narrator of his exploits in the chase, said to Molière, «There is an original that you have not copied.» In 24 hours the scene of the hunter was inserted; and as Molière was not acquainted with the terms of the chase, he requested Soyecourt himself to explain them to him. ‘L'Ecole des femmes’ (1662) met with critics, who, overlooking the art which prevails in the management of the inferior personages, and in the natural and quick transition from one surprise to another, animadverted upon some negligences of style. Molière answered them by his spirited ‘Critique de l'ecole des femmes’ (1663). The ‘Impromptu de Versailles’ was a reprisal occasioned by an attack of Boursault, who had written a piece against him, entitled ‘Le portrait du peintre.’ The court was much pleased in 1664 with ‘La princesse d'elide,’ a comic ballet, prepared for an entertainment given by the king. Another ballet, ‘Le mariage forcé,’ is drawn from Rabelais. ‘Don Juan’ (1664), excited much reprehension by the impiety of some of the expressions placed in the mouth of the profligate hero. Molière retrenched the objectionable parts in the second representation. ‘L'Amour médecin’ (1665) is one of the over-hasty works which are not to be strictly criticized. It was written, studied and represented within five days. In this Molière for the first time attacks the physicians. His great piece, ‘Le misanthrope’ (1666), was but moderately well received at first, but in the sequel was justly considered as one of the finest productions of modern comedy. It has been more admired in the closet than it has pleased on the stage — the reason Voltaire believes to be because the plot is delicate and ingenious rather than lively and interesting; because the dialogue, with all its beauty, does not always seem necessary and therefore retards the action; and because the *dénouement*, though skilfully introduced, leaves the spectator unexcited. In 1665 appeared ‘Le médecin malgré lui,’ a farce full of humor. ‘Le Sicilien’ (1667) is a short piece which pleases by its grace and gallantry. But his reputation was carried to its highest summit when ‘Le Tartufe’ appeared. Three acts of the comedy had been performed in May 1664 before the king; but its pointed wit gave great offense to all the ecclesiastical authorities, and it was not until 1669 that permission was given for adequate unexpurgated representation. In this hypocrisy is fully unveiled, the characters are equally various and true, the dialogue is elegant and natural, the *dénouement* alone is unsatisfactory. An impious and obscene farce, entitled ‘Scaramouche,’ having been represented at court, the king said to the great Condé, as he was leaving the theatre in his company, «I should like to know why the people, who are so much scandalized at Molière, say nothing about ‘Scaramouche.’» «The reason is,» replied the prince,« that ‘Scaramouche’ ridicules only God and religion, about which these people care nothing, while Molière's piece ridicules themselves.» In 1668 Molière published his ‘Amphitryon,» a free imitation of Plautus. With the exception of a tedious scene between Jupiter and Alcmena, nothing can be more humorous. ‘L'Avare’ (the Miser), an imitation of the ‘Aulularia’ of Plautus, is, in the leading character, a little overdone; but the multitude is only to be struck by strong traits. ‘George Dandin’; ‘Monsieur de Pourceaugnac’; ‘Les Fourberies de Scapin,’ are rather amusing than instructive. ‘Le Bourgeois Gentilhomme,’ though mixed with some buffooneries, is full of power. Molière bestowed more care on his ‘Femmes Savantes,’ a witty satire on affected taste and pedantic learning, which at that time prevailed in the Hôtel de Rambouillet. The incidents are not all well connected; but the subject, dry as it may be in itself, is exhibited in a truly comic form. The development is admirable, and has been a hundred times imitated. The same is true of the ‘Malade imaginaire,’ in which the quackery and pedantry of the physicians of the times are fully delineated. With this piece the author concluded his career. He was indisposed when it was performed, and the exertion with which he played produced convulsions, followed by a hemorrhage, and he died after the lapse of a few hours. The archbishop of Paris at first refused him burial; but the king himself insisted on it, and he was interred in the cemetery behind the chapel of Saint Joseph, Rue Montmartre. In 1792 his remains were transferred to the Museum of French Monuments, whence in 1817 they were removed to Père Lachaise.

Molière is the true father of French comedy. His works may be considered as a history of the manners, fashions and tastes of his times, and as the most faithful pictures of human life. Born with an observing mind, skilful in catching the outward marks of the passions and emotions, he took men as they were, and with singular felicity, exhibited the most sacred recesses of their hearts, and the tone, the action and the language of their various feelings. Of all who have ever written, Molière is the one who has best observed men without seeming to do so. His knowledge of human character seems to have come by intuition. In his domestic relations Molière was not fully happy; he who made merry on the stage with the weaknesses of other men could not guard against his own weakness. A violent passion induced him to marry the daughter of the actress Béjart, and he thereby incurred the ridicule he had so often cast on husbands of a disproportioned age. As an actor Molière was not to be surpassed in high comic parts, such as Arnolphe, Orgon, Harpagon, etc. An edition of Molière published at Paris in 1838 gave the actors' names after the *dramatis personæ*, from which we learn that Molière always played the principal comic parts himself. Among the last and best editions are those of Monval (8 vols. 1882); A. France (7 vols., 1876–91); and Desfois and Mesnard (11 vols., 1873–93). See DON JUAN; LEARNED LADIES, THE; MISANTHROPE, THE; TARTUFFE. Consult biographies by Baluffe (1886); Chatfield-Taylor (1906); Desfeuilles (1900); Larramouet (1886); Lotheissen (1880); Mahrenholtz (1881); Brander Matthews (1910); Mesnard (1889); Moland (1886); Regal (1910); Schneegans (1901); Trollope (1905); Wolff (1910); also ‘Lacroix, ‘Bibliographie Molièresque’ (1875); Loiseleur, ‘Points obscurs de la Vie de la Molière’ (1877); Livet, ‘Lexique de la Langue de Molière (1895–97); Miles, ‘Influence of Molière in the Restoration Comedy’ (1910).

MOLINA, mō-lē'nä, **Alonso de**, Spanish missionary: b. Escalona (Toledo), Spain, about 1510; d. Mexico, 1584. He accompanied his parents to San Domingo, and in 1523 went to Mexico, where he learned the Aztec language and acted as interpreter to the Franciscan monks, whose order he subsequently joined and engaged in missionary work, in which he was very successful. He was superior of the province of Santo Evangelio, and his books are among the earliest printed in America. Among them are ‘Diccionario de la lengua Castellana y Mexicana’ (1555); ‘Arte de la lengua Mexicana’ (1578); and several works in the Aztec language.

MOLINA, Juan Ignacio, Chilean naturalist and historian: b. province of Talca, Chile, 24 June 1737; d. Bologna, Italy, 12 Sept. 1829. He was educated in the Jesuit College at Santiago, and entering the order after its expulsion from America in 1767, settled in Italy. After 1774 he lived at Bologna, teaching and writing. He published ‘Compendium of Chilean History’ (1776); ‘Essay on Chilean Natural History’ (1782); ‘Essay on Chilean Civil History’ (1787), the last-named being translated into several languages, including English, etc.

MOLINA, Luis, Spanish Jesuit: b. Cuenca, New Castile, 1535; d. Madrid, 12 Oct. 1600. He entered the Jesuit Order (1553), was appointed (1570) teacher of theology at Evora, but turned to literary work (1590) and died soon after being called to the chair of moral theology at Madrid. His most important work is ‘Liberi arbitrii cum gratiae donis, etc., concordia’ (Lisbon 1588), which made him famous and created a great controversy; the Dominicans contested his views as antithomistic, but many Jesuits (Molinisten) defended him with the consequence that a quarrel ensued that ended in the Jansenist dispute. Consult Schneemann, ‘Die Entstehung der thomistische molinistischen Kontroverse’ (Freiburg 1879–80); Régnon, Th. de, ‘Bannésianisme et Molinisme’ (Paris 1890); Gayraud, ‘Thomisme et Molinisme’ (Toulouse 1890–92).

MOLINA, Olegario, Mexican statesman: b. Bolonchenticul, Campeche, 1843. He was educated in the Seminary of San Ildefonso, Merida, where he subsequently became a professor. Later he founded in Merida a school of primary and secondary instruction, and still later a benevolent society known as «The Youth.» During this period he established and conducted two journals, *La Guirnalda* and *Yucatan*; was elected to the Merida city council and later served one term in the national Congress. Returning to Yucatan he served as fiscal magistrate of the superior court of the state till in 1877 he took charge of the construction of the first railway in Yucatan, — the line which connects the cities of Merida and Progreso, — completing it in two years notwithstanding most discouraging conditions, and afterward and until 1881 operating it as manager. In the latter year he organized the present commission and banking house of O. Molina and Company. In 1902 he was elected governor of his state for the four years ending 1906, when he was re-elected. Owing to ill health he retired from the governorship at the end of the first year of his second term. In March 1907 he was appointed by President Diaz to the Cabinet position of Secretary of Fomento, colonization and industry. During his five years' service as governor Mr. Molina introduced and successfully carried through many important public improvements and reforms in the several departments of government, greatly advanced the cause of education, stamped out yellow fever at Merida and built a fine general hospital and an asylum for the insane.

MOLINA, Tirso de. See TÉLLEZ, GABRIEL.

MOLINARI, mō-lē-nä-rē, **Gustave de**, Belgian political economist: b. Liège, Belgium, 3 March 1819; d. 1911. He studied medicine and became a homœopathic physician in Brussels, but upon removing to Paris he entered journalism. His reputation as a radical compelled him to return to Belgium upon the accession of Napoleon III and he was appointed to the chair of political economy in the Musée Royal d'Industrie Belge. In 1881 he returned to Paris and edited the *Journal des Economistes* and later founded the journals *L'Economiste Belge* and *La Bourse du Travail*. Among his books are ‘Etudes économiques’ (1846); ‘Cours d'Economie politique’ (1861); ‘L'Evolution économique’ (1880); ‘Comment se resoudra la question sociale’ (1896), etc.

MOLINE, mō-lēn', Ill., city in Rock Island County, on the Mississippi River, and on the Chicago, Rock Island and Pacific, the Chicago, Burlington and Quincy and the Chicago, Milwaukee and Saint Paul railroads, adjoining Rock Island on the west, nearly opposite Davenport, Iowa, about 181 miles west of Chicago. In the part of the river between Moline and Davenport is an island from which to the shore have been built dams to secure water-power. Moline has good water-power which is utilized in developing the manufacturing industries. The extensive coal fields in the near vicinity contribute to the industrial development of the city. The chief manufactures are wagons, carriages, automobiles, tractors, furniture, agricultural machinery, steel, foundry and machine-shop products, steam engines, saw- and planing-mill products, pumps, paper, flour and dairy products. Some of the prominent buildings are a library building, which cost (1903) $50,000, a city hospital, several fine church and school buildings. The city library was founded in 1892 and contains over 16,000 volumes. There is a good library connected with the high school. The city owns and operates the waterworks. Pop. (1920) 30,709.

MOLINO DEL REY, mō-lē'nō dĕl rā, **Battle of,** in the Mexican War (q.v.). Having captured Vera Cruz (q.v.) in March, Gen. Winfield Scott (q.v.) continued on toward his objective point — Mexico City — and on the way fought and defeated the Mexicans in the battles of Cerro Gordo, Contreras and Churubusco (qq.v.). In order not to hinder the peace negotiations then under way, Scott, on 24 Aug. 1847, arranged an armistice with the Mexican general, Antonio Lopez de Santa Anna (q.v.) but Scott soon learned that, in spite of his pledge to the contrary, Santa Anna was strengthening his fortifications, casting cannon from old church bells, and in other ways preparing for a resumption of hostilities. On 6 September Scott ordered such activities to cease on pain of suspending the armistice and proceeding with his attacks. The next day Santa Anna replied accepting the latter alternative whereupon, on the night of the 7th, Scott drew up his troops preparatory to storming the Mexican works. Scott's troops were divided as follows: those under Gen. John A. Quitman (q.v.) at San Augustin; those under Gen. David E. Twiggs (q.v.) at San Angel; those under Gen. Gideon J. Pillow (q.v.) at Mexico, and those under Gen. William J. Worth (q.v) at Tacubaya, where Scott himself had his headquarters. A mile or so away was a cluster of stone buildings known as El Molino del Rey, which had been used a foundry and which formed the west end of an enclosure surrounding the hill and castle of Chapultepec. A short distance west of Molino was La Casa Mata, a strong stone building defended by an earthwork, between the two lying Mexican batteries and infantry; west of Casa Mata was the Hacienda de los Morales, where another body of Mexicans was lodged. At about 4 o'clock on the morning of 8 September Worth's division began the assault on the Mexican centre and left. The artillery thundered against the walls of Molino del Rey and the advanced batteries which, despite a desperate rally of the Mexicans, were captured; and the Mexicans on the left were driven from their position under the protecting guns of Chapultepec. The Casa Mata proved to be a stumbling block, since being surrounded with bastioned intrenchments and deep ditches, it afforded excellent protection against an assaulting column. The first American assault was repulsed, but after the Molino had been captured, all the American guns were brought to bear on Casa Mata. As the garrison was cut off from all support and exposed to a most destructive fire, the place was evacuated; two attempts were made to recover the lost position but nothing could face the terrific artillery fire of the Americans, so that by 9 o'clock in the morning the battle was over. The Casa Mata was then blown up and the troops were marched to Tacubaya to prepare for the final assault on Chapultepec (q.v.). The Americans engaged numbered less than 3,500 of whom 787 were killed or wounded; the Mexicans numbered at least 10,000 and lost 3,000 dead, wounded and prisoners, among the dead being two generals. Consult Ladd, H. O., ‘The Mexican War’ (pp. 244–48); Scott's ‘Memoirs’ (Vol. II); Wright, M. J., ‘Life of Scott’ (pp. 218–22); Wilcox, C. M., ‘History of the Mexican War’; Wiley and Rines, ‘The United States’ (Vol. VII, pp. 242–45).

MOLINOS, Miguel de, mē-gĕl' dā mō-lē'nōs, Spanish mystic, founder of the Quietists: b. near Saragossa, 21 Dec. 1640; d. Rome, 29 Dec. 1696. He studied at Pamplona and Coimbra, took holy orders, went to Rome in 1669, and there published in 1675 his ‘Guida spirituale,’ which urged the immediate presence of God and pure love toward God as the only way to salvation and peace, which cannot be attained until the soul is free from all that is material. His opponents, notably the Jesuits, held that this meant the indifference of the individual to the external world. In 1685 he was summoned before the Inquisition; two years later was found guilty of spreading dangerous doctrines. He publicly recanted all his teachings and was imprisoned until his death. Even Pope Innocent XI, a friend of Molinos, was examined by the Inquisition — but not as Pope, merely as Odescalchi, an individual. The ‘Spiritual Guide’ has been translated into the languages of Europe. See Quietism. Consult Bigelow, ‘Molinos the Quietist’ (New York 1882).

MOLLAH, mŏl'ạ, or **MULLAH,** mŭl'ạ, a Turkish title, originally meaning simply «lord,» or «sir,» in its narrower usage a judicial rank. In Turkey there are three classes of mollahs, with jurisdiction over divisions of various importance; those in control of small towns constitute the lowest grade; they, like the second grade, hold office only for a month at a time; the first grade is made up of those having legal authority over pashaliks. The mollah ranks below the kahiaskar and mufti, but is superior to the cadi. He is versed in both ecclesiastical and civil lore. Hence and because of its original meaning, the word is often used more loosely of Mohammedan dignitaries or scholars in Africa. See Mad Mullah.

MOLLAT, mōl'lät, **Guillaume Marie Charles Henri,** French clergyman and historian: b. Nantes, France, 1 Feb. 1877. He received his education at the Ecole des Hautes Etudes, Seminary of S. Sulpice, Paris, the French Seminary, Gregorian University and Vatican Palæographic School, Rome. In 1900 he was ordained to the Catholic priesthood; was chaplain of the church of Saint Louis of the French, Rome, 1902–05, chaplain of the

Basilica of Montmartre, Paris, 1905–08, and since 1914 assistant at the church of Our Lady of Mercy, Passy. He has written 'Mesures fiscales exercées en Bretagne par les papes d'Avignon à l'époque du Grand Schisme d'Occident' (1903); 'Etudes et documents sur l'histoire de Bretagne' (1907); 'Les papes d'Avignon' (1912); 'Etude critique sur les Vitæ Paparum Avenionensium d'Etienne Baluze' (1917). He collaborated in 'Dictionnaire Apologétique de la Foi Catholique'; 'Dictionnaire d'histoire et de géographie ecclésiastiques,' and is a contributor to 'The Catholic Encyclopedia,' the *Revue de l'Art Chrétien,* etc., etc.

MOLLENDO, mōl-lān'dō, Peru, a seaport on the Pacific Coast, in the department of Arequipa, near the mouth of the river Tambo, seven miles south of Islay. A railway connects it with Puno on Lake Titicaca. It is the port through which the bulk of the imports and exports of southern Peru and Bolivia pass. The principal exports are alpaca, wool, quinine, tin, silver and copper ores to an average annual value of $5,520,000; imports average $2,600,000. Pop. 4,000.

MÖLLHAUSEN, mėl'how'zěn, **Baldwin,** German traveler and novelist: b. Bonn, 27 Jan. 1825; d. Berlin, 28 May 1905. He studied agriculture in Pommerania, then went (1850) to North America, joining (1851) Duke Paul of Würtemberg and his party in the Rocky Mountains. He was wounded by Indians but, after five months, navigated the Mississippi to New Orleans. He became topographer and draughtsman, at the instigation of Alexander von Humboldt, for an American scientific expedition to the Far West, returning (1854), via San Francisco and the Isthmus of Panama, to Germany, where he was appointed custodian of libraries in Potsdam. He made another trip (1857–58) to North America exploring central Colorado. He wrote 'Tagebuch einer Reise vom Mississippi nach den Küsten der Südsee' (Leipzig 1858) and 'Reisen in die Felsengebirge Nordamerikas' (ib. 1861). Of his novels most relate to adventure in America. Noteworthy are 'Die Halbindianer' (1861); 'Der Flüchtling' (1862); 'Der Mayordomo' (1863); 'Das Mormonenmädchen' (1864; 3d ed., 1871); 'Reliquien' (1865); 'Die bieden Jachten' (1891); 'Der Spion' (1893); 'Das Fegefeuer in Frappes Wigwam' (1900), etc. A collection of his works was published (1906–13), under title of 'Illustrierte Romane, Reisen und Abenteuer.'

MOLLOY, Joseph Fitzgerald, Irish author: b. New Ross, County of Wexford, 19 March 1858; d. London, 19 March 1908. Among his numerous works may be cited 'Court Life Below Stairs, or London under the First Georges' (1882); 'Court Life Below Stairs, or London under the Last Georges' (1883); 'Life and Adventures of Peg Woffington' (1884); 'Life and Adventures of Edmond Kean' (1888); 'The Most Gorgeous Lady Blessington' (1896); 'Historical and Biographical Studies' (1897); 'The Queen's Comrade' (1901), etc.

MOLLUSCA, one of the great divisions or phyla of the animal kingdom, containing the oysters, clams, snails, slugs, squid and cuttlefish. The group is sharply marked off from all others and is characterized by the following features: The body is primarily bilaterally symmetrical with the mouth and anus at the two ends of the body, the alimentary tract traversing it as an axis, but this bilateral symmetry frequently becomes obscured by secondary changes, often of a torsional nature. On the lower surface of the body is developed a muscular outgrowth, the foot; while on either side a fold of skin arises near the back and hangs down enclosing a space between it and the body and foot. The fold is the *pallium* or mantle, and the cavity is called the mantle or branchial chamber, from the fact that the true gills (*ctenidia*) arise in the angle between mantle and body and project into the space. The dorsal surface of the body usually has the power of secreting a protective shell, ordinarily strengthened by carbonate of lime. The heart, which always contains arterial blood, lies in a chamber (the *pericardium*) dorsal to the intestines, while the excretory organs, which are true nephridia, connect the pericardium with the outer world. The nervous system consists of a series of paired ganglia connected by nerve-trunks. Of these ganglia the most constant are (1) the cerebral, at the anterior end, above the œsophagus; (2) the pedal in the foot; (3) the parietal on the sides of the body; and (4) the visceral near the hind end of the body ventral to the intestine. All of the 10,000 species of living mollusks are built upon this plan.

Details of Structure.— *Mantle and Foot.*— Typically the mantle is a paired structure, but in most groups the two halves unite in front and behind. This has its effect upon the shell, since where the lobes are separate, there are two halves or valves to the shell, but where united there is but a single (univalve) shell. Sometimes this univalve shell is a straight cone, but, while conical, it is usually coiled in a spiral, a part of the body extending toward the apex of the cone. As the animal increases in size the shells also increase in thickness and extent, the successive additions being usually recognizable on the external surface by lines of growth which run parallel to the free edge of the shell. When the edge of the mantle is provided with projections, lobes, etc., these cause ridges or protuberances on the surface of the shell. When the mantle is colored (striped or spotted), the color-pattern is reproduced in the shell, since pigment from the mantle is deposited along with the carbonate of lime. There is also a structure to the shell which needs mention. On the outside is usually a thin organic cuticle and beneath this two layers of carbonate of lime. Sometimes the inner of these layers consists of thin lamellæ parallel to the surface, the free edges of which produce diffraction spectra and thus give the inside of the shell an iridescent appearance — mother-of-pearl. See PEARL.

In the bivalve shell (see BIVALVES) an elastic hinge ligament connects the two valves and causes them to open. The valves are closed by muscles (adductors), one or two in number, which extend across the body, from valve to valve. In the univalves there is always a muscle attached to the inside of the spiral, by the contraction of which the animal is retracted into the shell, the foot being the last part to disappear. In many groups the posterior dorsal part of the foot bears a horny or calcareous plate, the *operculum,* which closes the aperture of the shell like a door when the animal is retracted. On the other hand the shell is frequently greatly reduced and may become internal, as in the slugs and squid; or it may be entirely absent in the adult, as in the so-called naked mollusks (nudibranchs) although it is formed in the young and later lost.

Foot.— The foot, which projects from the mid-ventral surface of the body, shows great modifications, but is rarely lacking. Usually it forms a broad creeping disc on which the animal glides about, but in the *Scaphopoda,* as in most *Pelecypoda,* it is flattened from side to side and forms an efficient digging organ. In the cephalopods it becomes developed in part into the tube (siphon) connecting the mantle-cavity with the exterior; in part into the tentacles surrounding the head.

Digestive Organs.— The alimentary canal is typically a straight tube, but in most forms it becomes convoluted to increase the amount of digestive surface, while not infrequently it is so flexed on itself that mouth and vent, instead of being at opposite ends of the body, are in close proximity to each other. In all except the *Pelecypoda* the region of the mouth contains a peculiar structure, variously known as the lingual ribbon, radula or odontophore. This consists of a strong band, having upon its upper surface numbers of rows of hard horny teeth — in fact, a flexible file; and of muscles adapted to draw it back and forth over any object to which the mouth may be applied. In this way the snails rasp away vegetation, or, as in the case of shells of other mollusks, are perforated in order that the soft parts may be reached and devoured. In the cone-shells a poison-gland is connected with the lingual ribbon. Wear at one end of the ribbon is made good by constant growth at the other end. Behind the gullet is a large sacular stomach, and closely connected with it are the ducts of the voluminous liver. The intestine is long, without enlargements, and in many acephala is remarkable for passing through the heart.

Circulation.— The heart lies dorsal to the digestive tract enclosed in a special sac, the pericardium, which is to be regarded as the sole representative of the true body-cavity or cœlom. (See EMBRYOLOGY). In the heart two parts are always to be distinguished, a muscular ventricle which forces the blood through the arteries to all parts of the body, and one or two auricles which receive the blood as it comes from the gills and force it into the ventricle. As will be seen, the heart thus receives only oxidized or arterial blood. With the loss of the gill of one side the corresponding auricle disappears. When four gills are present as in the nautilus, there are four auricles. In the cephalopods branchial hearts, which force the blood through the gills, occur. At one time it was thought that some of the blood-vessels opened to the exterior, but this has been shown to be a mistake. The blood is usually yellowish or colorless, but occasionally is red, the color being due to the plasma and not to the contained corpuscles which resemble the leucocytes of the blood of man.

Gills.—As was mentioned above, there may be two kinds of gills, the ctenidia and the secondary or adaptive gills, the latter occurring only in the gasteropoda. The ctenidia, which always occur in the angle between mantle and body-wall, consist, typically, of a series of filaments with blood-vessels in the interior, the filaments and the ridge from which they spring resembling somewhat the teeth and back of a comb, whence the name (Greek *κτενός* comb). The ctenidia are typically paired, but in the nautilus there are two pairs, while in many gasteropods one ctenidium (that of the left side) is lost. The adaptive gills occur on various parts of the body, usually upon the back. In most land snails (*Pulmonata*) the gills entirely disappear and an air-breathing organ, the lung, is developed on the walls of the mantle cavity, the opening to it being usually on the right side of the body.

Nerves.— The nervous system was described above. It is only necessary to say that the ganglia may coalesce into a smaller number. There are usually present three pairs of sense organs, a pair of eyes connected with the cerebrum, a pair of so-called ears (really organs of equilibration) connected with the pedal ganglia, and a pair of organs of smell (osphradia) with the visceral ganglia. Of these the eyes are the least constant. In some cases they are replaced by numerous other eyes developed upon the back or upon the edges of the mantle.

Viscera.— The excretory organs are true nephridia, that is, coiled tubes opening at one end into the cœlom (pericardium), and at the other to the external world. They are also known as the organs of Bojanus. The reproductive organs are large. Usually the sexes are separate, but some, like the land-snails, are hermaphroditic. In no case is an asexual reproduction (fission, budding, etc.) known. A few bring forth living young. In many species a metamorphosis occurs during the development. In these a peculiar larva, known as the *veliger,* hatches from the egg, a larva which develops from a «trochosphere» form like that of the annelids, a resemblance which points to a relationship between the two groups. The veliger receives its name from the «velum,» a circle of cilia upon the dorsal side of the head above and in front of the mouth, by means of which the larva swims.

Classification.— The mollusks are divided into five classes, *Amphineura, Pelecypoda or Acephala, Scaphopoda, Gastropoda* and *Cephalopoda.*

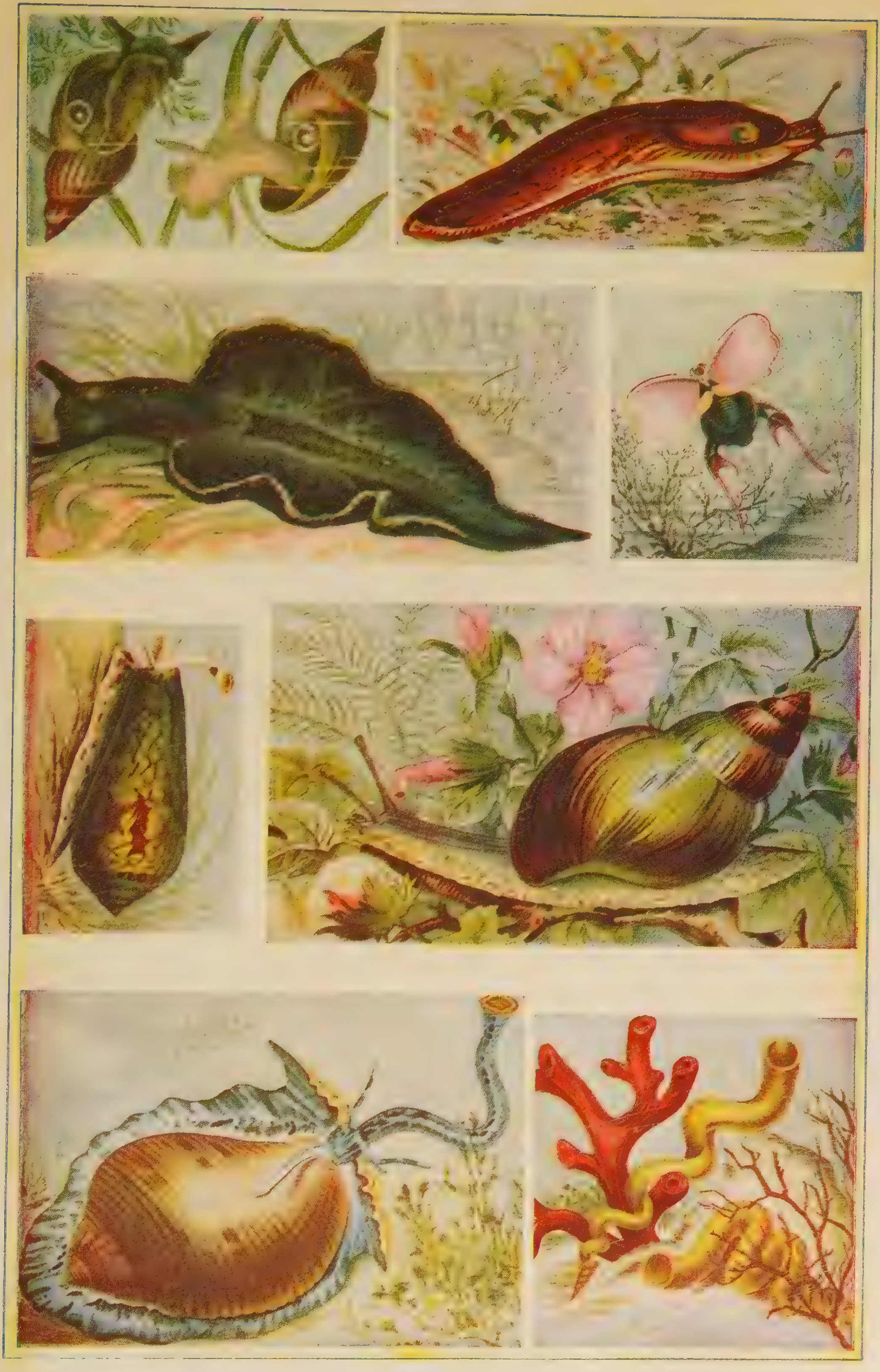
Amphineura.— This, the most primitive group of mollusks, contains the chitons (*Placophora*) and the *Solenogastres,* in both of which the body is markedly bilaterally symmetrical, while the nervous system is of a very low type. The chitons (q.v.) are flattened and covered with eight transverse plates of shell. The *Solenogastres* are worm-like shell-less forms of the deeper seas.

Pelecypoda or *Acephala.*— These are the mollusks which have the shell in two parts or «valves,» no head, and the filaments of the gills more or less completely united into a couple of leaves (lamellæ) on either side of the body. See BIVALVES.

Scaphopoda.— This class includes a few marine forms of small size known as tooth-shells, from having shells shaped somewhat like an elephant's tusk, and open at both ends. See DENTALIUM.

Gastropoda.— In these, the so-called snails, the foot is usually a broad creeping disc and the head is well developed. See GASTROPODA.

MOLLUSCA



1. Pond Snail (Limnea stagnalis). 2. Slug (Arion empiricum). 3. Green Sea-Slug (Elysia viridis). 4. Pteropod (Hyalea tridentata). 5. Cone-shell (Conus textilis). 6. Achatina (Achatina mauritanica). 7. Tun-shell (Dolium galea). 8. Wormshell (Vermetus gigas).

Cephalopoda.— In these the head is well marked off from the body, and the mantles of the two sides are united so that a single mantle cavity results, which is open to the exterior in front. See CEPHALOPODA.

Formerly two other orders of mollusks were recognized, the *Heteropoda* and the *Pteropoda,* but the heteropods are now known to be prosobranchs, the pteropods to be opisthobranchs, both being modified for a life on the surface of the sea.

Bibliography.— Hescheler, in Lang's ‹Comparative Anatomy› (2d ed., 1896); Woodward, ‹Manual of the Mollusca› (4th ed., 1880); Cooke, ‹The Mollusca› (in Cambridge Natural History, Vol. III, 1895); Kingsley, ‹Standard Natural History› (Vol. I, 1885); part V of ‹A Treatise on Zoology,› edited by E. Ray Lankester, by Paul Pelseneer (London 1906); Tryon and Pilsbury began in 1896 a work in which they proposed to describe and figure every known species of mollusk. For mollusks of the United States consult writings of Gould, Binney, Morse, Tryon, Dall, Verrill, Bush, Stearns, etc.

MOLLUSCOIDA, a group of animals formerly recognized by some naturalists, which included the *Brachiopoda,* the *Polyzoa,* and the *Tunicata* (qq.v.). On account of misinterpretations of structure these were once included in the *Mollusca,* and when removed from that group the name Molluscoida was given. Next the *Tunicata* were removed to the *Chordata,* and later the group *Molluscoida* was abandoned.

MOLLUSCS, Eggs of. See EGG.

MOLLWITZ, mŏl-vĭts, Prussia, a village of Silesia, 25 miles southeast of Breslau, which gives its name to the battle fought to the east of the village 10 April 1741 between the Prussians under Frederick the Great and the Austrians under Marshal Neipperg. About 20,000 troops were engaged on each side, and the Austrians gained the first advantage in putting the Prussian cavalry to flight. The Prussian infantry, however, commanded by Marshal Schwerin, stood their ground for five hours and won the battle. The Prussians lost 5,500 men and the Austrians 5,340. The victory led to an alliance between France and Prussia, and to Austria ceding the province of Silesia to Frederick the following year, to dissolve the alliance.

MOLLY MAGUIRES, an Irish secret society formed in 1843 at Farney, County Monaghan, to intimidate bailiffs or process-servers distraining for rent, or others impounding the cattle of those who were unable or unwilling to pay rent. A similar society called by the same name, existed 1854 to 1877 in the mining districts of Pennsylvania. The members disguised in ‹Molly Maguire› or women's dresses, sought to effect their purpose by intimidation, and in some cases by murder. Under perilous detective work, several at length were arrested, tried and executed, and the society finally disbanded.

MOLLYMAUK, a bird. See FULMAR.

MOLMENTI, mōl-män'tē, **Pompeo Gherardo,** Italian author: b. Venice, Italy, 1852. He studied law and practised in Venice, but abandoned it to become professor of Italian literature at the Liceo Marco Foscarini. His literary work comprises critical essays, history of literature and art and also fiction, among which are ‹Impressioni litterarie› (1873); ‹Studi e ricerche di storia e d'arte› (1892); ‹Antonio Fogazzaro› (1900). His greatest work is ‹Storia di Venezia nella vita privata› (Bergamo 1908–09; Eng. trans. by Brown, New York 1908) for which he was elevated to the rank of Senator of the Kingdom.

MOLOCH, mō'lŏk, or **MOLECH** (Heb. *mōlekh,* king), called in Scripture (I Kings 11, 7) an idol of the Ammonites, the fire-god of Phœnicia, also identified as the Carthaginian god, Kronos or Saturn. The image was an iron statue, with a human body, the head of an ox, and extended arms. The statue is said to have been heated by a fire placed in the lower part, and children were placed as offerings in the arms. The cult was introduced into Judah, and Solomon built a temple to Moloch on the Mount of Olives.

MOLOCH, a small Australian desert-lizard (the *moloch horridus*) of the family *Agamidæ,* whose skin is covered with irregular plates bearing thorny pointed tubercles, spines and prickles all over the body, but especially well developed behind the head. Altogether its appearance is alarming, reminding one of a miniature of some armored saurian of the Mesozoic era. It is, however, quite harmless, subsists mainly on ants, and its repulsive aspect, as in the case of the similar horned toad (q.v.), is wholly defensive in two ways — first as a real defense against being too readily seized and swallowed by enemies, especially serpents; and second, by exposing a very large and highly absorbent surface to whatever moisture the air may contain. Consult Saville-Kent, ‹Naturalist in Australia› (1897).

MOLOKAI, mō'lō-kī, Hawaii, an island of the group about 40 miles long and seven to nine miles broad. It is noted for the government settlement for lepers where Father Damien spent his noble life of self-sacrifice. See HAWAII; LEPROSY.

MOLOKANI, mō'lō-kä'nē, or **MALAKANES,** a Russian sect. It derives its name through its custom of living on milk (*moloko* or *malako*) on fast days. Istineeye Christiane (true Christians) is the name they give themselves, also «Gospellers.» The sect arose in the middle of the 18th century in the government of Tambof. About 3,000 of them colonized, early in the 19th century, in the Crimea. Their claim is that the Bible is their sole foundation and they repudiate ceremonial, veneration of icons, priesthood, etc. They abstain from pork. They pay their devotions in prayer, hymn-singing and Bible-reading, besides religious conversations. The meetings are held in private houses conducted by a presbyter and two assistants. They stand high in morals and brotherly benevolence. In theory they are against rulers and taxes or military service, yet are loyal, peaceful subjects in practice. Consult New Schaff-Herzog (New York 1911).

MOLTING, the change of skin, or of such cutaneous or partially cutaneous appendages as hair or feathers, which occurs annually or periodically in animals of many sorts, such as arthropods, birds, reptiles, amphibians, etc. It is a process often perilous to the animal, being not infrequently attended by loss of life. In mammals it may be gradual, as when the pelage or hair is changed. Examples of analogous processes are the annual shedding of the antlers of deer in spring, or the autumnal dropping of the horns of the pronghorn antelope.

Molting in Amphibia and Reptiles.— Here the entire skin is cast. The newt in early spring sheds its skin by detaching it from around the jaws, then pulling it back over the head and the limbs. The toad in molting causes the old skin to split along the back, it then pulls it off as one would a coat by working the muscles of the back; it is detached by movements of the head from around the lips, face, eyes and mouth; the skin is more readily pulled off from the legs to the tips of the toes. The skin, as in salamanders, is a thin film, and it comes off in four pieces. Immediately after molting the creature is shy and active. Sharp describes the molting of the common striped snake (*Eutænia sirtalis*). One came out of the water in a vivarium, gliding on to the grassy sod; it then shrugged itself for a moment, when the skin parted at the jaws. The skin on the head, however, remained fixed, so that when the creature crawled out the old skin was inside out. The operation took less than one minute. The rattle of the rattlesnake (q.v.) consists of those parts of the successive molts which are retained by a long knob made by the coalescence of the last few caudal vertebræ.

Molting in Birds.— The feathers may all be cast or only a part of them. Young birds molt several times before adult age. The passerine birds undergo a complete ecdysis after the breeding season is over (post-nuptial), when the worn-out plumage is restored; and they may also before the breeding time pass through an incomplete molt, when their wedding dress is put on. The process is so gradual as a rule that few birds, except the ducks, etc., are unable to fly, or go unprotected. The height of the molting season is in August, though the feathers drop out in nearly every month of the year. The complete molt is undergone in from a month to six weeks' time. Besides their feathers the pelican sheds a horny projection on the ridge of the bill, and the puffin and certain allied species shed the horny sheath of the bill, etc. For further information see PLUMAGE.

Molting in Arthropods.— In most arthropods the various developmental stages become indicated in the external appearance of the animal by means of the successive molts, for no modification of form is possible without the removal of the rigid exoskeleton. The Arachnid *Limulus*, the common horsefoot crab (q.v.), frequently sheds, its skin opening around the edge of the head; this is also the case with the fresh-water crustacean *Apus*. In the crayfish and lobster the skin splits open between the thorax and abdomen, and the animal draws itself out of the transverse rent thus formed. The skin is cast entire, while the chitinous lining of the mouth, throat, fore stomach and of the rectum is also shed. The process of exuviation in the crayfish has long been known to be aided by the outgrowth of little delicate papillæ called casting-hairs; these serve to loosen the old integument; recently Packard has discovered similar papillæ on the new or under-skin (hypodermis) of the lobster, and similar undergrowths aid the serpent in shedding its scaly epidermis.

In insects molting is frequent, especially in the larva stage, most caterpillars molting four or five times. The body moves convulsively and splits along the back, at the same time, casting hairs being usually absent, a molting fluid is poured out which serves to detach the old skin. The head is molted separately, the shell falling off by itself, then the body-skin is shuffled off, being pulled back toward the tail, and with the outer integuments all the lining of the digestive canal is shed (except that of the stomach and beginning of the intestine), and the lining of the spiracles, as well as the cuticle of all the hairs, and the spines.

Consult Dwight, 'The Sequence of Plumage and Molts of the Passerine Birds' (Annals New York Academy of Sciences, Vol. XIII, 1900); Mivart, St. J., 'The Elements of Ornithology' (London 1892); Newton, 'Dictionary of Birds' (1893–96); Packard, 'Text-book of Entomology' (1898). Further details will be found in the articles in this encyclopedia on specific groups of animals and the authorities mentioned therein.

MOLTKE, Helmuth Karl Bernhard, hĕl'moot kärl bĕrn'härt mŏlt'kĕ, COUNT VON, German soldier: b. Parchim, Mecklenburg-Schwerin, 26 Oct. 1800; d. Berlin, 24 April 1891. In 1805 his father removed to Lubeck, where young Moltke shortly afterward saw his home looted and burned during the French invasion and his family reduced to poverty. In 1812 he was admitted as a cadet of the Royal Military Academy, Copenhagen. In 1818 he was appointed one of the pages of the king of Denmark and passed his examination for a commission as first of the candidates. Seeing little prospect of advancement, he entered the Prussian service in 1822, becoming 2d lieutenant. He then studied three years at the staff college, Berlin; in 1832 was appointed to the general staff; in 1833 became lieutenant, and in 1835 captain. He had already visited Italy, and he now went to Turkey, where he became military adviser of the sultan Mahmud. He took part in the Turkish expedition against Ibrahim Pasha in 1839, but his advice was disregarded, and he returned to Constantinople, and on Mahmud's death to Berlin, where he was again employed on the general staff. His experiences in Turkey led him to publish two valuable works 'The Russo-Turkish Campaign of 1828–29 in European Turkey' (1835), and 'Letters on Affairs in Turkey in the Years 1835–39' (1841). After rising through the various army grades he was placed permanently at the head of the general staff of the army in 1859 with the rank of lieutenant-general. His labors in reorganizing the Prussian army were of immense value to Prussia and to Germany, and had a great influence on the general history of Europe. The defeat of Denmark in 1864 was largely owing to his genius for military operations, and the result of the greater war of 1866 against Austria is equally to be attributed to him. Then followed the Franco-German War of 1870, for which Moltke was entirely prepared, having foreseen for some years what was likely to happen, and having immediately after the Austrian War prepared for a campaign against France. The brilliant success which followed was in very large measure a personal triumph for Moltke. He passed his 70th birthday at Versailles, and was raised by the king of Prussia to the rank of count on receipt of news of the capitulation of Metz. On his return to Berlin he was made a field-marshal, received from Parliament a grant of $225,000, was appointed for life a member of the Prussian upper house, and other honors were conferred upon him. He held the post of chief of the staff till after the accession of Emperor William II in 1888, when he resigned on account of advanced age, but was made president of national defense. His 90th birthday was made the occasion of public demonstrations in his honor all over Germany. He was a man of great modesty and simplicity, kind and considerate to subordinates, and devoted, above all things, to duty. His military genius was compounded of boldness in design with minute care in execution. From his reticence it was wittily said that he was silent in seven languages. Besides the works already mentioned, Moltke wrote 'Letters' (1892), and the works of the general staff on the Italian War of 1866, and the Franco-German War of 1870–71 are largely from his pen. Consult the 'Essays, Speeches and Memoirs' (2 vols., London 1893); also Bigge, W., 'Feldmarschall Graf Moltke' (2 vols., Munich 1901); Dressler, F. A., 'Moltke in his Home' translated by Barrett-Lennard (London 1907); Müller, W., 'Moltke' translated by Pinkerton (London 1879; 3d ed., Stuttgart 1889).

MOLTKE, Helmuth von, German general: b. 1848; d. 18 June 1916. A nephew of the famous strategist, he was appointed chief of the general staff in 1906, an event which occasioned considerable speculation in Germany. The general impression was that von Moltke had been chosen by the Kaiser as a convenient figure-head, and that the War Lord really intended to be his own chief of the general staff. Von Moltke did not originate, but rather identified himself with, the standing plan of campaign to be adopted in a war on two fronts, namely, the rapid invasion of Belgium and lightning descent upon France during the period of Russian mobilization. The breakdown of that plan led to serious differences between the Kaiser and von Moltke; the latter had not displayed the military genius of his uncle, and was dismissed from his post early in December 1914, to be succeeded by the Kaiser's favorite, General von Falkenhayn. See WAR, EUROPEAN — WESTERN FRONT.

MOLUCCAS, mō-lŭk'az, or **SPICE ISLANDS,** East Indies, three groups of islands in the Malayan or Indian Archipelago (q.v.), between Celebes and New Guinea, and the Philippines and Timor Archipelago. (1) The Ternate Islands, or Moluccas proper, consisting of Ternate, Gilolo, Batshian, Obi, Morti Islands and numerous islets. (2) The Amboyna Islands, including, besides Amboyna, which is the chief seat of government for the whole Moluccas, the islands of Ceram, Booroo and other smaller islands. (3) The Banda Islands. They are nearly all mountainous, and some of them have peaks rising to a height of 7,000 feet or 8,000 feet, mostly volcanic; there are still several active volcanoes in the group, and earthquakes are of frequent occurrence. Their aggregate area is estimated at 195,650 square miles; population 361,000. Cloves, nutmegs, mace and sago are exported to Europe; and birds'-nests, trepang, and shark-fins to China. The Moluccas, discovered in 1512, were alternately in the possession of the Spaniards, Portuguese and Dutch. They were taken from the latter by the British in 1796, and in 1810, but in 1814 again given up to Holland, in whose possession they still remain. The general language on the coast is the Malay.

MOLY, magic herb of the ancient Greeks that Homer says Hermes gave to Odysseus as a talisman against the enchantments of Circe. The plant is described as having milk-white flowers, and has been identified by different scientists under different herbs of the *Liliaceæ* family, as the white water-lily, also as the garlics. *Allium magicum L.*, or *Allium Moly L.* were claimed by Italian Renaissance botanists, but these kinds have yellowish-red to red bloom instead of white, causing some to claim *Allium nigrum L.* or black hellebore, as more probable. See ALLIUM; GARLIC.

MOLYBDENITE, mō-lĭb'dē-nīte, a native sulphid of molybdenum crystallizing in tabular or hexagonal forms. It commonly occurs in granite, gneiss and other crystalline rocks. In the United States it is found in the New England States, and in New York, Pennsylvania, Colorado and California. It also occurs in Canada, in Pontiac County, Quebec, in Renfrew County, Ontario, and in other parts of the world. It is the chief of the commercial ores yielding the important metal molybdenum (q.v.), among which also are wulfenite, molybdite and other minerals, described as follows:

Molybdenite or molybdenum disulphide, MoS_2, contains about 60 per cent molybdenum and 40 per cent sulphur. It is a soft, opaque mineral, with a lead-gray color, sometimes bluish or brownish, and with metallic lustre. When crystallized it is found in tabular or short prismatic, hexagonal crystals. It has a perfect cleavage, and yields flakes which are flexible but not elastic. It is sectile and feels slightly greasy. Its hardness is 1 to 1.5, and its specific gravity is 4.7 to 4.8. Its streak is lead-gray metallic, bluish-gray on paper, and greenish on glazed porcelain. It occurs in fine granular or foliated masses or scales scattered through or imbedded in many crystalline rocks, including granite, gneiss, zircon syenite and granular limestone. Its appearance is similar to that of graphite, for which it is frequently mistaken by the prospector. *Wulfenite* is a molybdate of lead, $PbMoO_4$, and contains about 26.2 per cent molybdenum and 56.4 per cent lead. Its color is bright red to orange or wax-yellow; sometimes brown, grayish-white, or nearly colorless; occasionally yellowish-gray to pale green. Its lustre is resinous to adamantine. When crystalline it is translucent and occurs commonly in thin, square, tabular, tetragonal crystals. Sometimes octahedral and prismatic forms are found. It occurs also as crystal crusts and in massive granular forms. It is always found with other lead minerals, especially pyromorphite and vanadinite. It has one good pyramidal cleavage, and two less distinct. It is brittle and its fracture is subconchoidal.

Its hardness is 2.75 to 3, and its specific gravity is 6.7 to 7. Its streak is white. *Molybdite,* or molybdic ochre, is a hydrous ferric molybdate, $Fe_2O_3.3MoO_3.7\frac{1}{2}H_2O$, and contains 39.6 per cent molybdenum. It occurs as an earthy, yellow powder, or in hair-like crystals of pale yellow color, usually associated with molybdenite, of which it is an alteration product. Alone, it is not an important ore of molybdenum. It has a dull lustre, a straw yellow streak, a hardness of 1 to 2, and a specific gravity of 4.5. *Powellite* is calcium molybdate, $CaMoO_4$, and contains 48 per cent molybdenum. Sometimes tungsten replaces part of the molybdenum. It is greenish-yellow to dull gray in color, subtransparent, resinous, without cleavage, has an uneven fracture, a hardness of 3.5, and a specific gravity of 4.52. *Ilsemannite* is an oxide of molybdenum, $MoO_2.4MoO_3$, and contains about 68 per cent molybdenum. It is a blue-black to black cryptocrystalline mineral, associated with barite and wulfenite. It is soluble in water, giving a deep blue solution which on evaporation yields dark blue crystals. Rare. *Belonesite* is magnesium molybdate, $MgMoO_4$, and contains 52 per cent molybdenum. It is a white transparent mineral, occurring in minute tetragonal crystals. It occurs in rock fragments enveloped in Vesuvian lava. Rare. *Pateraite* is cobalt molybdate, $CoMoO_4$, and contains 43.8 per cent molybdenum, or it is molybdate of cobalt and iron, $FeCoMo_2O_8$, and contains 44.1 per cent molybdenum. It is an impure massive black mineral associated with uranium minerals. Rare. *Achrematite* is lead arsenate, chloride and molybdate, $3(3Pb_3As_2O_8.PbCl_2)4(Pb_2MoO_5)$, and contains 3.4 per cent molybdenum. It is a massive, cryptocrystalline mineral with an uneven to subconchoidal fracture, is brittle, has a hardness of 3 to 4, and a specific gravity of about 6. Its color is sulphur-yellow to orange and red, but in mass is liver-brown, owing to admixture of limonite. Its streak is pale cinnamon brown. Its lustre is resinous to adamantine, and fragments are translucent on thin edges. *Eosite* is a vanado-molybdate of lead, $Pb_8V_2MoO_{16}$, and contains 8.9 per cent molybdenum. Its color is deep Aurora-red. It has a brownish, orange-yellow streak. Its hardness is 3 to 4. It occurs in minute octahedral crystals of the tetragonal system which are found on pyromorphite and cerrusite. *Molybdurane* is molybdate of uranium, $UO_2UO_3.2MoO_4$. *Molybdoferrite* is molybdate of iron, $FeMoO_4$.

MOLYBDENUM, mō-lĭb'dē-nŭm, a pure white metal, softer than steel, malleable and capable of being forged and welded. It can be filed and polished and may be drawn into ribbons and fine wire. Metallic molybdenum is used in various electrical contact making and breaking devices, in X-ray tubes, in voltage rectifiers, in the form of wire for filament supports in incandescent electric lamps, for winding electric resistance furnaces and in dentistry. It is also employed in the manufacture of chemical reagents, dyes, glazes and disinfectants. The principal use of molybdenum is in the manufacture of special alloy steels, usually in conjunction with chromium, manganese, nickel, cobalt, tungsten or vanadium. These steels are used for self-hardening and high-speed machine tools, for crank-shaft and propeller-shaft forgings, high-pressure boiler plate, armor-piercing projectiles, permanent magnets and wire. During the World War the main uses were for gun-linings, armor plates, projectiles and in the motor industry, especially in the crank-shafts and connecting-rods of Liberty motors. The purest molybdenum is produced from wulfenite, but practically the whole of the world's supply of the metal and its compounds is obtained from molybdenite (q.v.). Molybdenite resembles galena in some respects and owes its name to this fact, the word «molybdenite» being based upon the Latin name for galena. It was first clearly distinguished from galena by Scheele in 1778, and in 1782 Hjelm obtained the element molybdenum in the metallic form. Molybdenum may be prepared by reducing the oxide by hydrogen, carbon or potassium cyanide, as well as by various other methods. It has a specific gravity of about 8.6 and a specific heat of about 0.0659. Its melting point is higher than that of platinum. Molybdenum is not affected by air or moisture at ordinary temperatures, but oxidizes slowly when heated in air, and at high temperatures it burns, whether heated in air or in steam. Chemically, molybdenum behaves both as a metal and as a non-metal. It has the chemical symbol Mo and an atomic weight of 96 if $O=16$, or 95.3 if $H=1$. It forms several oxides, of which the trioxide, MoO_3, is the most important. This is the oxide that is formed when the metal is burned in air, and it may also be prepared by roasting the native sulphide in air. The trioxide occurs native in small quantities, as «molybdenum ochre,» or «molybdite.» Metallic molybdenum combines directly with chlorine to form $MoCl_5$, and with bromine to form $MoBr_4$; but it does not combine directly with iodine. Unlike the other metals, molybdenum does not readily replace the hydrogen of acids to form definite salts, but its oxides dissolve in acids with the formation of compounds which have, as yet, been but little studied. The trioxide combines with water to form substances of the nature of acids, and which are, in fact, called «molybdic acids.» These further combine with metallic bases to form an extensive series of compounds known as «molybdates.» Ammonium molybdate is used in the laboratory as a reagent for the detection of phosphoric acid, a yellow precipitate being thrown down when a nitric acid solution of ammonium molybdate is added to a solution containing a phosphate. Consult Wolf, H. J., ‹Molybdenum› (Golden, Colo., 1918); Wilson, A. W. G., «Molybdenum» in ‹The Mineral Industry during 1916,› Vol. XXV.

MOLYNEUX, mŏl'ĭ-nooks, **William,** Irish philosopher: b. Dublin, 17 April 1656; d. there, 11 Oct. 1698. He was graduated from Trinity College, Dublin, entered the Middle Temple, London, became a student of applied mathematics and philosophy, and a friend of Locke; was elected F. R. S. in 1685 and was elected to Parliament for Dublin University in 1692 and 1695. Besides his ‹Dioptrica nova› (1692) on optics and philosophy, he wrote ‹The Case of Ireland's Being Bound by Acts of Parliament in England› (1698), a work on the legislative independence of Ireland, which created a considerable sensation.

MOMBASA, mŏm-bä′sä, Africa, an island and town on the east coast, the town, capital of the Seyidie province, the chief seaport and the seat of administration of British East Africa, being on the north side of the island, which is three miles long by two and one-half miles wide, close to the coast, 150 miles north of Zanzibar, lat. 4° 3′ S. Here are an old Portuguese fort, a new European hospital and the offices and workshops of the British East Africa Company. A short railway connects Mombasa with Kilindini, the naval coaling depot, on the other side of the island, where is the residence of the chief administrator of the company. Mombasa is also the terminus of a railway connecting with the Victoria Nyanza. Trade in (imports) piece-goods, brass and iron wire, beads, rice; and in (exports) ivory, gum, copal, copra, ochella weed, maize and grain; carried on by natives of British India. Pop. about 30,000. Island and port are mentioned as early as 1331. It was visited by Vasco de Gama in 1497, held by the Portuguese from 1529 to 1698 and by the British from 1824 to 1826, but the British refused to accept cession of it. Soon after the sultan of Muscat obtained possession of the town, which at his death fell to his son, the sultan of Zanzibar. In 1888 the Imperial British East Africa Company received governing rights over it from the sultan of Zanzibar, since when it has passed definitely over to the possession of Britain, along with the huge territory on the mainland allotted to that country.

MOMENT of a dynamical quantity is the importance of that quantity in regard to its dynamical effect relatively to a given point or axis. The moment of a force about a point is the product of its amount into its perpendicular distance from the point. The tendency of the action of such a force is to cause rotation about an axis perpendicular to the plane passing through the point and containing the force. Thus, in the case of a pendulum, the effectiveness of the force in causing rotation is measured by the moment Wl, where W is the weight of the pendulum, and l is the distance of the line of action of the force W from the centre of rotation C, or the distance of the centre of mass G from the vertical line through C.

The term moment enters into several other phrases, all of which relate either directly or indirectly to rotation. Thus, there is the moment of momentum, or angular momentum, whose rate of change is the measure of the moment of the force producing the change. To obtain it for any given body rotating with angular speed ω about an axis, we first imagine the body broken up into a great many small portions of masses m_1, m_2, m_3, etc., at distances r_1, r_2, r_3, etc., from the axis, multiply the momentum $(mr\omega)$ of each mass by its distance, and then take the sum of all these products. The angular speed w being the same in every expression, the moment of momentum takes the form $\omega\ (m_1r^2_1 + m_2r^2_2 +$, etc.), which it is usual to write in the symbolic form $\omega\Sigma\ mr^2$. The quantity $\Sigma\ mr^2$, which is the sum of the products of each mass into the square of its distance from the axis, is called the moment of inertia about that axis. It is the factor in the moment of momentum which depends upon the distribution of matter in the body. It enters into all questions of mechanics in which rotation is involved, from the spinning of a top or the action of an engine governor to the stability of a ship. By an obvious extension, the word moment is also used in such combinations as moment of a velocity and moment of an acceleration. Such phrases correspond to nothing truly dynamic, unless we regard velocity as meaning the momentum of unit mass and acceleration as the rate of change of that momentum.

If the mass of every small portion of matter in a body be multiplied by the square of its perpendicular distance from a straight line, the sum of all such products is called the moment of inertia of the body about the line regarded as an axis. The radius of gyration of the body is the distance from the axis at which all the matter of the body might be concentrated without altering the moment of inertia. Thus, if 1 is the moment of inertia of the body, M its whole mass and k its radius of gyration, $1 = M\,k^2$. We see that the moment of inertia of a body about a line is found by adding a great number of products of small masses and squares of distances; if the body can be defined mathematically as to shape, size and density, finding its moment of inertia is a problem of the integral calculus.

MOMENT OF INERTIA. See MECHANICS.

MOMENTUM, in mechanics and physics, the product of the mass and velocity of a body. Like velocity, momentum is usually regarded as having a definite direction, as well as a definite numerical magnitude. The momentum generated by a constant force acting upon a material particle for a definite length of time is numerically equal to the product of the force by the time during which it acts, and has the same direction as the force. See MECHANICS.

MOMIERS, mō′my′ā′, from the French term for mummers. It was a nickname given in derision to the followers in Switzerland (1814) of the Baroness von Krüdener (q.v.), who charged the State Church with apostacy, held great conventicles and lived as æsthetics. They were led by the Geneva clergyman, H. L. Empeytaz, César Malan, L. Gaussen, Merle d'Aubigny and F. Monod. From this sect arose the Evangelical Society at Geneva (1832), the Free Evangelical Church (Église libre) of 1848 that, in 1883, divided and went into even severer directions. Consult Goltz, von der, 'Die reformierte Kirche Genfs in 19 ten Jahrhundert' (Basle 1864).

MOMMSEN, mŏm′zĕn **(Christian Matthias) Theodor,** German epigraphist and historian: b. Garding, Schleswig, 30 Nov. 1817; d. Charlottenburg, near Berlin, Prussia, 1 Nov. 1903. He was a student of jurisprudence and philology at the University of Kiel; took his Ph.D. in 1842; published with his brother Tycho and his friend Storm a volume of verse which was scathingly condemned by the reviewers (1843); began more successfully his career as historian with the treatise 'De Collegiis et Sodalitiis Romanorum' (1843), commended for its thoroughness and a clarity of style new to German works of this kind; and in 1844–47 was in France and Italy under commission of the Berlin Academy, collating manuscripts and inscriptions. On his return he edited for a short while the *Schleswig-Holsteinische Zeitung*, and in 1848 became professor of Roman law at Leipzig. He entered politics as an advocate of constitutional progress, was arrested for inciting to revolt, and though acquitted by the courts was deprived of his professorship. From that time he was an eager if not invariably judicious disputant in many political controversies. He was appointed to the professorship of Roman law at Zürich in 1852, at Breslau in 1854; and from 1858 until his death was professor of ancient history in the University of Berlin. In 1873 he was elected perpetual secretary of the Berlin Academy; but this post he resigned in 1895. For 10 years (1873–82) he was a Liberal member of the lower house of the Prussian parliament, where he bitterly attacked Bismarck's domestic policy. In an election speech at Charlottenburg in 1882 he characterized the Iron Chancellor's tariff measures as a «Politik von Schwindel.» Such boldness could not go unrebuked, and Mommsen was brought to trial for slander. His acquittal by both a lower and an appeals court was one of his great triumphs. He sternly advised the Teuton element in Austria in the struggle with the Czechs; made some caustic observations in a *North American Review* article on British treatment of minor nations; to the last was quite as belligerent as ever.

But he was only incidentally the politician. He was pre-eminently what Freeman called «the greatest scholar of our times, well nigh the greatest scholar of all times» (‹Methods of Historical Study›). He was distinguished as a epigraphist, historian, jurist, numismatist and philologian. None in the 19th century, which he almost spanned, has, as Freeman goes on to say, «taken in so wide a range of subjects, all brought with the happiest effect to bear upon and to support one another.» To the educated reader at large he will probably continue to be best known for his ‹Römische Geschichte› (3 vols., 1854–56; 8th ed., 1889), to the battle of Thapsus; together with Vol. V on the provinces from Cæsar to Diocletian (1885). Volume IV, on Imperial Rome, was unfinished at his death. There are English renderings by W. P. Dickson (Vols. I–III 1862–66; Vol. V 1886). This work opened a new epoch in historiography. Though written with great spontaneity, without even references to original sources, it was based on unrivaled knowledge, and presented its material with extraordinary clearness and at times with brilliancy. It is of course somewhat dogmatic, is certainly unfair to Cicero, and has been blamed, by Freeman among several, for undue glorification of mere power and success. To scholars Mommsen is above all the editor of the great ‹Corpus Inscriptionum Latinarum› (1863 et seq.; Vols. I, III, VIII, IX, by himself; others under his immediate supervision). Every inscription of this monumental collection was taken down from the original. The errors and falsities of predecessors were cleared away, and a scientific foundation was supplied for the study of Roman antiquities. Mommsen's preface to the series is said to be thought by critics one of the finest specimens of Latin prose written in modern times. For a complete list of his writings, Zangemeister's ‹Mommsen als Schriftsteller› (Heidelberg 1887; new edition by Jacobs, with additions, 1905) should be consulted. Mention may be made of ‹Römisches Münzwesen› (1850), ‹Römische Chronologie› (1859) and ‹Römisches Staatsrecht› (1871–88). All are standard, but the last, particularly, by the breadth and completeness of his exposition of the Roman constitution, places Mommsen among the foremost of constitutional writers. He also edited the ‹Res Gestæ Divi Augusti ex Monumentis Ancyrano et Apolliensi› (1865; new ed. 1883); the ‹Digesta› in Vol. I of the ‹Corpus Juris Civilis› (6th ed., 1893), and many other publications. His library, when partially burned in 1880, was replenished by gifts from foreign scholars. In 1902 he was awarded the Nobel prize in literature. Consult Hirschfeld, O., ‹Gedächtnisrede auf Theodor Mommsen› (1904); Sandys, J. E., ‹A History of Classical Scholarship› (Vol. III, Cambridge 1908); Wachsmuth, C., ‹Worte zum Gedächtniss an Theodor Mommsen› (Leipzig 1904).

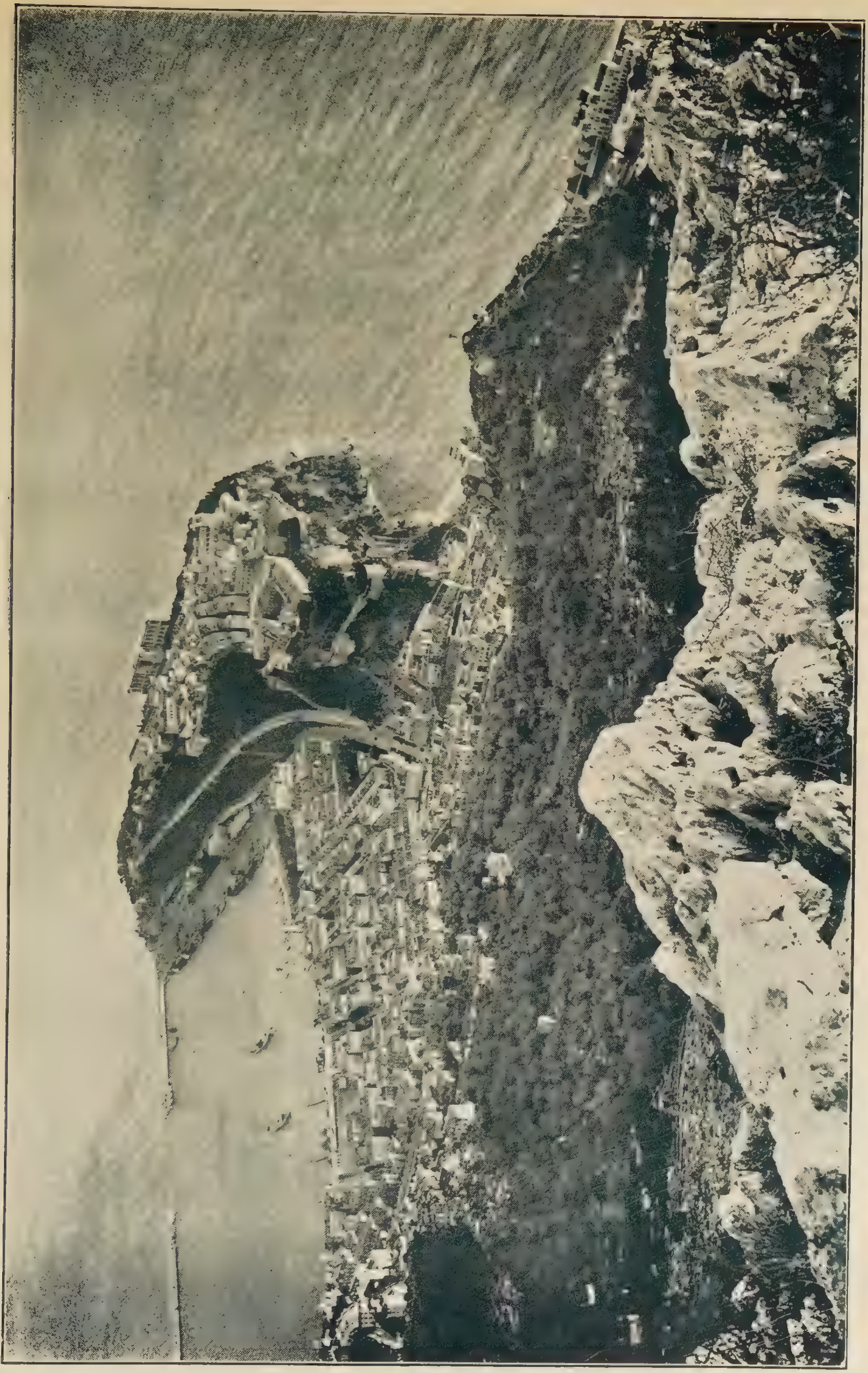
MOMORDICA, a genus of plants of the gourd family, remarkable for their strangely marked seeds. Two or three species are cultivated in the United States as ornamental plants, one of which (*M. charantia*) produces a food for the Chinese in the pulp about the sculptured seeds; another Oriental food, the golkokra of India, is the fruit of *M. cochinchinensis;* and the balsam-apple (*M. balsamina*) furnishes a healing principle which is infused in oil to form a liniment highly esteemed in the Levant.

MOMOTOMBO, mō-mō-tōm'bō, Nicaragua, an active volcano rising 4,250 feet from the northwestern shore of Lake Managua. Eruptions took place in 1852, 1902 and 1905. The nearby village of Momotombo is connected by rail with Chinandega.

MOMPOS, mōm-pōs', Colombia, a town of the province of Bolivar on an island formed by the Rio Magdalena about 180 miles south of the deltaic mouth. The streets, which extend parallel to the river, are well laid out, but the houses are badly built. Mompos is a depot of foreign goods destined for consumption in the valley of the Magdalena; but the changes in the river's course rendering it unnavigable have seriously injured its prosperity. Pop. 11,000.

MOMUS, in Greek mythology, the god of satire and mirth. He is generally represented raising a mask from his face and holding a small figure in his hand. His mother was Nyx, the goddess of night. As a mocking censor and carping critic Jupiter cast him out of heaven.

MONA, mō'nạ (1) a West Indian islet belonging to the United States since 1898. It lies 42 miles east of Porto Rico, in the middle of Mona Passage, to which it gives its name; seven miles long by two miles broad, its area is nearly 10,000 acres. It is of coral formation, with a general level about 60 feet above the sea. A range of hills on the east side of the island runs from north to south, the highest peak of which is 175 feet above the water. The island is well watered and well drained, has a luxuriant vegetation and all kinds of tropical fruits grow in profusion. It is the



THE HARBOR OF MONACO

Showing the New Oceanographic Museum at the Tip of the Mainland

nesting place of thousands of green turtles, and the surrounding waters teem with the finest varieties of fish. The only residents belong to the lighthouse establishment; off the northwest point is Monita islet; (2) the ancient name mentioned by Tacitus for the island of Anglesey (q.v.), Wales, also applied by other ancient writers to the Isle of Man.

MONA, a West African monkey (*Cercopithecus mona*), remarkable for its brilliant coloration, the head being olive-yellow, with a black stripe on the forehead; yellowish whiskers and a purple face. The back is chestnut-brown, the undersurface is white and there is a white spot on each side near the root of the tail, which is black. It is constanly seen in menageries.

MONACO, mŏn′ä-kō, the smallest independent European principality, bordering on the Mediterranean, nine miles east of Nice, and enclosed on its land borders by the French department Alpes-Maritimes. It had an area of 53 square miles until 1861 when the Prince of Monaco ceded Mentone and Roccabruna to France for 4,000,000 francs. The principality has since been confined to the towns of Monaco, Condamine and Monte Carlo with the surrounding districts, having an area of about eight square miles, and a population of about 23,000. The expenses of government, municipal and other, are defrayed by a joint-stock company, which carries on the famous gaming establishment at Monte Carlo (q.v.), and which also pays a handsome yearly sum to the Prince for the concession. The capital, Monaco (pop. 2,247), situated on a lofty promontory overlooking the sea, in the midst of olive, orange and lemon groves, is a renowned watering-place. Here are the palace and cathedral. There are numerous hotels and an English church at Monaco. In the 10th century the Emperor Otho I conferred Monaco on a prince of the house of Grimaldi, a scion of which (through a female branch) still continues to rule.

MONAD, *in biology.* See INFUSORIA.

MONADNOCK, mō-năd′nŏk, New Hampshire, an isolated mountain of a typical erosion character, near the southwest corner of the State, in Cheshire County, 10 miles southeast of Keene. The base covers an area of five miles by three, and the altitude is 3,186 feet above the level of the sea; it is composed of slate, talc and mica. The summit commands a fine view, and it is a conspicuous landmark, visible even from the dome of the state house at Boston.

MONADNOCK. See PENEPLAIN.

MONAGAS, mōn-ä′gäs, **José Tadeo,** Venezuelean soldier: b. Maturin, Venezuela, 28 Oct. 1784; d. El Valle, Venezuela, 18 Nov. 1868. He served in the War of 1813–21 under Bolivar and rose to the rank of brigadier-general and was afterward engaged in various military measures until 1830 when he became a member of Congress. Bolivar's death occurring in 1831 Monagas retired but was soon called to the command of the Orient. In 1835 he supported a revolution but made his peace with the government a few months later and in 1847 was elected President. His administration was at first marked by liberal measures, but his policy becoming arbitrary he was deserted by his party, whereupon he abolished Congress and assumed a dictatorship. He defeated Paez who led a revolutionary movement against him and disregarding his treaty, imprisoned him, and in 1851 took command of the army, the presidency being held by his brother. In 1855 he was re-elected, but a revolution followed and he was compelled to leave the country in 1858, after resigning the presidency. He returned in 1864 and in 1868 headed a successful revolution and was elected President by Congress, but died before being installed in the office.

MONAGHAN, mŏn′ạ-hạn, **John James,** American Roman Catholic prelate: b. Sumter, S. C., 23 May 1856. He was educated at Saint Charles College, Md., pursued a theological course at Saint Mary's Seminary, Baltimore, and was ordained to the priesthood in 1880. He held several pastorates in Charleston, S. C., and elsewhere, was chancellor of the diocese 1887–88, and assistant to the vicar-general at Saint Patrick's, Charleston, 1888–97. In May of the last-named year he was consecrated bishop of Wilmington.

MONAL, or **MONAUL,** a name among Anglo-Indian sportsmen for any of several Himalayan pheasants, especially the gorgeous species of the crested genus *Lophopterus.* See IMPEYAN PHEASANT.

MONAMINE, *in chemistry,* an amine that is derived by replacing one or more of the hydrogen atoms of a single molecule of ammonia by an equal number of monovalent organic radicals. Amines that are derived by joining two, three or four molecules of ammonia, through the partial replacement of their hydrogen by a single polyvalent radical, are called ditri-, and tetra- amines respectively; and the monamines are known as primary, secondary or tertiary, according as one, two or three of the hydrogen atoms of the ammonia molecule have been replaced. See AMINE; AMIDE.

MONARCH BUTTERFLY. See DANAIS; MILKWEED BUTTERFLY.

MONARCHIANS, a sect in the early Church who asserted the oneness and singleness of the divine person, as at variance with the orthodox doctrine of the Trinity, three Persons and one God. The supremacy of God the Father, they maintained, was impugned by those who said that the Son was coeternal. If there was but one God, they taught, and Jesus Christ was God incarnate, then the Father must have suffered and died. Hence they were called Patripassians (q.v.). Christ was therefore merely one form or mode of the Father's manifestation; and the Father might also manifest himself through the Holy Spirit. This theory was called Modalism or Monarchial Modalism and its teachers Modalists. Praxeas (q.v.), a Christian of Asia, brought this doctrine to Carthage in the 2d century and was controverted by Tertullian (q.v.). The most noted of Patripassians was Sabellius (q.v.), and Modalism was widely known as Sabellianism in both the Eastern and Western Churches. There were other Monarchians called Dynamic Monarchians who taught that Christ became Son of God dynamically, by having certain powers bestowed upon him in his adoption by baptism. Pope Victor I in the 2d century excommunicated Theodotus the Tanner who professed this theory, and an Asiatic synod (268) condemned and anathematized the view as taught by the noted Paul of Samosata (q.v.), the minister of Zenobia (q.v.), queen of Palmyra. Monarchianism was revived in the 16th century by Socinus, and is in some form or other the essential basis of certain Unitarian creeds. Consult Harnack, A., 'History of Dogma' (Vol. III, Boston 1897).

MONARCHY (Fr. *monarchie,* from Lat. *monarchia,* from Greek *μοναρχία*, rule of one, sole power). In the course of history, the word monarchy has been subjected to so many interpretations and has been applied to so many different kinds of governments that an exact definition or a classification of its main divisions is difficult. Strictly speaking, the word means undivided sovereignty or rule of a single person, and hence it has been used to describe states in which the sovereign or supreme authority is vested in a single individual, the monarch, who in his own right is the permanent head of the state. The king or chief magistrate of a state may properly be termed a monarch only when he possesses the entire ruling power, but the term monarchy has outlived this original meaning and in popular language is used somewhat loosely to designate that form of government in which the chief authority is exercised by a hereditary sovereign as distinguished from republics with elected presidents, or for the «monarchial principle» as opposed to the republican. Still more loosely the term is used to designate any government in which the political head is called king or prince, regardless of the authority he may exercise or the manner in which political power is distributed. The changes in the power exercised by the monarchs of Europe have necessitated the invention of new terms for general use in describing the various forms of government, but these terms in themselves are a contradiction of the true meaning of monarchy. We now have «limited» or «constitutional monarchy» as opposed to «absolute» or «autocratic monarchy,» and a distinction is also made between «hereditary» and «elective monarchy,» though the distinction is unimportant since these terms do not indicate the nature of the government.

As stated above, the absolute monarchy is the only real monarchy in the strictest interpretation of the word, since it is the only government in which the ruler is absolutely supreme. (See ABSOLUTISM). A mixed or limited monarchy is one in which the ruler, though still possessing the status and dignity of royalty, shares the supreme governmental powers either with a body of nobles, or with a popular representative body, or with both. A constitutional monarchy is one in which the power of the ruler is restrained by a constitution. Woolsey says: «Mixed monarchies are something more than limited ones. There may be a limited monarchy where king and people, the former restricted by a constitution, the latter organized and invested with certain means of preventing illegal government, are the only forces. This may be called mixed, perhaps, yet the term rather inclines to embrace only such states as have three or more political powers, as king, nobles and people, united in the government, or the same powers with the clergy, as in many mediæval states. Thus all mixture contains limitations but all limited governments are not mixed.» There are now no constitutional or limited monarchies wherein the sovereign possesses power to legislate by decree and in such a monarchy the democratic element is the only authority directly exercising any great degree of actual power. Monarchies are usually hereditary though they sometimes have been elective, but in the latter case they have generally been attended with disastrous feuds, and great confusion in the elections, as in Poland. Of the elective monarchies the most conspicuous were the papal states, the Pope being elected by the cardinals; but the states of the Netherlands were termed republics even though in some of them the office of stadtholder was hereditary. In Europe all monarchies were originally elective, within certain limits; and subsequent to the introduction of Christianity kinship with the reigning family did not count so much as the essential condition of the assumption of sovereign power as the «sacring» by the divine authority of the Church. Constitutional monarchs in their origin may be elective or they may combine both systems, as when one family is disinherited and the supreme power under certain conditions declared hereditary in another. The purely hereditary principle is of comparatively late origin, the outcome of obvious convenience which became a religious or quasi-religious dogma. The absolute monarchies of the present day are Abyssinia, Afghanistan and Siam; and the limited monarchies are Belgium, Great Britain, Denmark, Greece, Italy, Japan, Montenegro, The Netherlands, Norway, Persia, Rumania, Serbia, Spain and Sweden.

The conception of monarchy was derived through Christianity from the theocracy (q.v.) which was the earliest form of state and which was developed in Asia and northern Africa. The theocracy was ruled by a high priest or by a king or prince who represented within the limits of his dominions the monarchy of God over all things; hence religion was the bond of union and the idea culminated in the 17th century in the doctrine of divine right of kings. Therefore, when later transformed from a divinely ruled state into one with a human king, the distinguishing mark was despotism. But this barbarous form of monarchy was rejected by the people of Aryan origin who gave some recognition to individual and class rights apart from the rights of kings and princes. Though at first the monarchies were absolute, yet the absolute monarchs were not always tyrannical but in many cases ruled for the good of their subjects. Among monarchs of this class were Henry IV, Saint Louis, Canute, Charlemagne and others of the early centuries of European history and the «enlightened» or «benevolent» despots of the 18th century. The essential basis of the feudal monarchy (which followed the decline of Carolingian authority) was the bond of fealty between the king or supreme lord and his vassals, who derived from him their rank, power and property. The mediæval monarchy was followed by the modern absolute monarchy which first made its appearance in France, proclaiming the doctrine of divine right of kings and culminating in the absolutism of Louis XIV. The Stuarts of

England held this doctrine but the monarchial principle was shaken to its foundation by the execution of Charles I and the English revolution of 1688, and was completely shattered by the French revolution of 1789. Since that time the monarchies of western Europe have been transformed into constitutional or limited monarchies, the growth of democratic ideas having infringed upon and greatly reduced the former powers of the king or emperor. «Monarchists,» strictly speaking, have long been a small and dwindling minority. See KING; ABSOLUTISM; SOVEREIGN; STATE; GOVERNMENT; THEOCRACY; REPUBLIC; FEUDAL SYSTEM; and the descriptions of the governments of the various nations. Consult Brougham, H. P., ‹Political Philosophy,› Pt. I (London 1842); Bluntschli, J. K., ‹The Theory of the State› (6th ed., trans., Oxford 1885); Woods, F. A., ‹The Influence of Monarchs› (New York 1913); Woolsey, T. D., ‹Political Science› (Vol. I, pp. 487–585, New York 1878); articles on divine rights in *The Outlook*, 10 Sept. 1910; *Living Age*, 26 July 1913; and *Current Literature*, October 1910; and articles on modern kings and rulers and their influence as listed in the guides to periodical literature.

MONASTERY. See MONASTICISM.

MONASTERY, The, a novel by Sir Walter Scott, published in 1820, the scene of which is in Scotland in the 16th century. In this tale Scott for the first time introduces a supernatural element, as in the mysterious appearances of the «White Lady of Arenel,» and for this reason the book was never as popular with English readers as his other tales. Its sequel, ‹The Abbot,› appeared the same year.

MONASTIC ARCHITECTURE. East Indian.— The Buddhist priests' monasteries, known as *vihâras*, either adjoined or were included in the *chaitya*-house (building surrounding the shrine). The most ancient (*Hinayâna*) erected monasteries are no longer in existence, but we know that the Jetavana monastery of Srâvasti in the 5th century A.D. had splendid buildings seven stories high. The existing ancient monasteries are those cut into the living rock. Of these perhaps the following are of greatest interest: Those on the hills of the Upper Godaveri River, at Nasîk; the Gautamâ-putra monastery («Cave III»), belonging to the 2d century A.D. One of the grandest extant monastic structures is the Mahâyâna chaitya of Ajantâ, but the magnificent chaitya-house at Kârlê carved in the rocks of the Western Ghats, between Bombay and Poona, is considered to show the Hînayâna School in its best light. The Buddhist rock-cut vihâra at Bedsâ, a 2d century B.C. work, has its cells round a chaitya-house, an apse around the chaitya and the usual barrel roof. The usual form of Indian monastery consisted of rows of cells ranged about the shrine, which was surmounted by its heavy mound (*stupa*). The architectural plan somewhat resembles the basilica with its interior lined with pillars and the shrine located in the domed extremity opposite the façade. The style of the Dravidian religious edifice, with its pyramid-crowned gateway (*gopura*), choultries, etc., belongs to the subject Architecture. See ARCHITECTURE — *Sasanian and Mohammedan.*

Eastern Church.—The early Basilian monks attempted no special style or application of architecture, using the Byzantine, Greek or Eastern plans as best suited for their allocations. From 306 to 322 the ascetics were withdrawing in bodies to the deserts, and under such leaders as Paul, Anthony and Pachomius, they established monasteries. To such belong those of Mount Athos (Rumelia), others in the Balkans, in Armenia, the Libyan Desert («Coptic»). Many of these «Levantine» monasteries were devoid of all external architecture, rendered as inconspicuous as possible to avoid drawing the attention of the passing marauding bands of natives. They were usually surrounded by a high blank wall. The 4th and 5th century monasteries established under Pachomius rule in the Libyan Desert had small buildings, called *laura,* which contained separate cells, known in their combination as *cœnobia,* the dwellers thereby being called *Cœnobites.* They were governed by an *abbas* (father), *hegumenos* (leader), or *archimandrite* (superintendent).

Western Church.— *Benedictine Monasteries.* — Saint Benedict published his ‹Rules› and established his monastery at Monte Casino about 520, but the first positive and complete information we have on monastic architecture of his Order is the plan (designed in 822) for the construction of the monastery of Saint Gall. The precept of Saint Benedict demanded that all the workers of the monastery should find their workshops inside the walls of the enclosure. In the Saint Gall plan the grounds form a long rectangle in which the church is about the centre. Annexed to the church are the dwellings of the monks, the chapter-house, cloister and refectory. In a wider circle are grouped the residence of the abbot, the school house, the lodgings for strangers, the stables, brewery, bakery, mill, workshops and barns. Behind the church are located the hospital with residence for physicians and a garden for cultivating medicinal herbs. Here are also an acolytes' school, cemetery, horticultural and vegetable gardens and a poultry yard. This ambitious plan was not carried out in its entirety and few of the buildings are now in existence.

Cistercian Monasteries.— While the Benedictines aimed at richness in architectural effect, especially in their church edifices, the Cistercians held to strict simplicity. Their mother monastery was at Clairvaux, but the abbey of Maulbronn, Württemberg, founded 1146 and finished in the 13th century, has come down to us in such a good state of preservation as to serve best for model. It is (according to periods of construction) in Late Romanesque, Transition and early Gothic. The cloister forms the central point connecting on the south with the church, on the east with the chapter-house and on the north with the men's refectory. To the west lies the lay refectory and, somewhat separate, we find the residence of the abbot and the farm buildings. When pressed for space the refectory served also as chapter-house, where the monks gathered daily to hear a chapter read from the ‹Rules› and in which the more important affairs were discussed. The monks slept at first in a common dormitory but later received separate cells. The dormitory was usually located in an upper story and the cell contained only a bedstead, table and stool and a window. The superiors, however, had more spacious and better furnished rooms.

Premonstratensian and Grandmontine Monasteries.— In these the central point of the enclosure is occupied by the cloisters, which include a separate court enclosed entirely by galleries under which the doors of the different apartments are located. In the centre of the court are a well and a cistern. The abbey church occupies one entire side of the square, either the north or south side. The western side of the cloisters is attached to the building which forms the exterior façade of the abbey and is composed of cells or stores of provisions surmounted by the dormitory of the menial servants. On the side of the square facing the church is the kitchen, communicating with the refectory by a wicket. The refectory has an elegantly carved chair for reading. On the east, following the refectory, come the workroom or several apartments serving as library, scriptorium, shops, etc. On the eastern side of the cloisters, between the working quarters and the church choir is a passage affording access to the gardens, then comes the chapter-hall, generally several steps downward from the cloisters with which it communicates by a great portal flanked by two richly adorned windows. It is generally vaulted and neatly decorated; the abbots were often interred under its pavement. The sacristy is usually located between the chapter-hall and the church, also the vestment room and chart room; sometimes a prison cell for delinquents. Above these compartments extends the dormitory of the monks, communicating by a staircase with the church choir. Opposite the stairway is the cell of the abbot overlooking his monks. The collection of buildings is closed in by a watercourse or walls with an entrance on the east facing the façade of the abbey. The porter's lodge is located alongside. Within this enclosure are the lodgings for the laity; eastward are the apartments for ecclesiastical guests and the novitiate. The agricultural buildings (near a stream) and the mill and factories are scattered on the sides, the infirmary being carefully isolated.

The monastic housing plans of the Jesuits differed greatly from those of the mediæval monasteries. They rivaled one another in beautifying and enlarging their buildings and grounds. The church, of course, showed the chief magnificence, but the libraries and refectories boasted all the ornamentation the architectural periods afforded. They set aside special spaces for festivities and for the entertainment of distinguished guests, even furnishing (in Austria) a theatre, Imperial hall and ducal hall. Good examples exist at Ottobeuren, Salem, Ettal, Saint Florian near Linz, Melk (Lower Austria). The Carthusians adopted a plan differing in many respects from other Orders; the Knights Templar united military architecture with that of the monastery. The Franciscans and Dominicans of the 13th century dropped tradition in modifications, and by the 17th century followed no style entirely. The Cluniacs (from 912) developed the Romanesque style in their monasteries. The Cistercians (from 1098) adapted the Gothic to their needs, and the Trappists also utilized the Gothic style. In Italy the Renaissance period (of course) furnishes the finest specimens of monastic architecture. Of such perhaps the most prominent is the Certosa, near Pavia (Carthusian), built 1473, with its celebrated church façade, considered to be the most magnificent monument of the Italian early Renaissance. The Carthusian monastery, built by Michelangelo, which adjoins the Santa Maria degli Angeli church at Rome (now the Museo Nazionale delle Terme), is noted. The cloister of Santa Croce, Florence, contains the greatly admired portal of Brunelleschi. Consult Havell, E. B., 'Ancient and Mediæval Architecture of India' (London 1915); Jubainville, d'Arbois de, 'Essai de l'état interieur des abbayes cisterciennes' (Troyes 1863); Lenoir, 'Architecture monastique' (Paris 1852–56). See ARCHITECTURE; BYZANTINE ART; CHRISTIAN ARCHITECTURE.

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MONASTIC ART. In its final analysis art is the visible, concrete proof of the development and stage of advance or decay of civilization. And the most prominent fact in connection with the history of art of the Christian era is that the holy flame of the spirit of artistic effort was kept burning for numerous centuries solely by the aid of the Catholic Church (Eastern and Western), while all outside of the monasteries was in a riot of barbarism, devastation, murder and rapine.

Art in the Eastern Church.— The basilicas (q.v.) of the early Christians, themselves designed on pagan lines but adapted to their needs, used for internal decoration the art of mosaics, which flourished in the 6th and 7th centuries. The monks produced manuscripts from the hands of their miniaturists, wonderful in their lovely illumination and calligraphy, beautiful creations in ivory, impressive examples of gold and silver-smithing, enamel work, embroidery, etc. These are in the style termed Byzantine. (See BYZANTINE ART). The conquering barbarians, with no native art of their own or knowledge of the antique, quickly absorbed the prevailing style, adopting it together with the religious influences of the Christian Church. With the fall of the Roman Empire workers in the arts were driven to the Orient for their existence and art flourished in the churches of Constantinople and Jerusalem. The Basilians, an order founded by Saint Basil (d. 380), had, among their «rules,» the mandate that *work* was part of their monastic life; and art was one of the chief «works» done in producing the decorative elements of the churches. In this mediæval period we find the monastic life spreading from its centre (Constantinople) to Mount Athos (from 960). Greek monasteries were founded at Rome in the 6th and 7th centuries, the cult reaching to south Italy, Sicily and Calabria. From the monastic art standpoint of great importance is the fact that Basilian monachism spread into Russia, and, its art accompanying it, was absorbed by the Slavs (Kiev c. 1050). The Byzantine miniaturists were in the zenith of their fame up to the 11th century.

Art in the Western Church.— All the above art work was under Oriental (Mohammedan) influence. In the 11th century commences the true Christian monastic art of Europe, but we must go much further back for its inception. The early Christian art of the monasteries of the Irish and the Anglo-Saxons (about the 5th century) remains a source of bewilderment and mystery when we consider its marvelous (exquisite illuminated manuscripts, art jewels inlaid with enamels, etc.) execution and remember that the artist-monks had but just been converted to the Christian faith. And it was Winfred (683–755), an English priest who went as a missionary to Friesland and established successful monasteries and the adjunct art cult through North Germany, to be canonized as Saint Boniface after his martyrdom. From the 6th century the Benedictine Orders, starting from Monte Casino, Campania, carried on the entire culture of Europe for 500 years, the arts being a large and valuable part of the work. The «Rules» of Saint Benedict, disclosed in his ‹Regula Monachorum› show the system required of the monks in their work. Cassiodore followed Saint Benedict soon with his monastery at Viviers in Calabria and its library, where in their cells (called *scriptoria*) the calligraphists and illuminators did their copying of manuscripts, illuminating and painting as well. And we now come to the great crowd of painters, sculptors and architects as well as calligraphers and illuminators that were trained by the orders to radiate their influence and example through all classes of society. And it is to these disciples that the world owes all it owned of art from the 7th to 12th centuries. Great centres of Benedictine work, besides Monte Casino (Italy), were the Alemannic domain of Saint Gall and Reichenau, later Hirsau and Fulda, in Germany. In France led the Cluniacs (from 912); in England York and Canterbury were great monastic art centres. In this interesting period we find hard manual labor, side by side with intellectual endeavor, done by monk and prelate alike. We find Abbot Herluin carrying sand and mortar during the building of the monastery at Bec in 1033; Canonicus Hezelo, rich and distinguished, became a monk at Cluny so as to be able to work as *coementarius* (stone-mason) on the great abbey church founded by Hugo; Count Frederick at Verdun, as a monk at Saint Vannes, in 1000, dug the foundation to the dormitory with his own hands. The ranks of the monks of that day contained a remarkable number of versatile artists. Tutilo of Saint Gall (end of the 9th century), Ekkehard tells us, was painter, sculptor, poet and teacher; Abbot Mannius of Evesham, England, was noted as painter, musician, calligraphist and goldsmith; Fulco, the præcentor of Saint Hubert's monastery in the Ardennes, was architect and miniature painter, besides being mentioned as an efficient stone-mason and carpenter; the Allemannic chronicler Herman the Lame, at Reichenau, was a talented writer, poet, musician, while he was practised in astronomy and mechanics, at the same time being busy in making musical instruments and clocks. Bernward (b. 993, d. 1022), who rose from monk to bishop of Hildesheim, produced art work in metal and precious stones, some of which exist at the present day. He worked hard introducing the arts and crafts into Germany, and established schools and studios in his palace, sending pupils abroad to learn the different Byzantine arts, secrets and styles. Thiemon, monk at Altaich and later archbishop of Salzburg, was painter (as he himself claimed when suffering martyrdom in Palestine) as well as architect and goldsmith. And we come, in the 12th century, to the great monastic influences over the arts in France. The prelates of that period greatly enriched their churches (especially with goldsmithing work) with beautiful utensils for the cult. Of such monastic art patrons we find the name of Lambert, abbot of Saint Bertain at Saint Omer; of Gérard, bishop of Angouléme (d. 1136). But towering above all others would appear to have been Suger, who was abbot of Saint Denis (d. 1152), minister of Louis the Lusty and regent under Louis VII. Suger was censured by Saint Bernard for his rich beneficence to the artisans in embellishing his church. To his fine vessels in the precious metals he added furniture of great artistic refinement, also beautiful bronze doors with bas-reliefs of the Passion, etc. The episcopal and monastic schools of this century were producing more numerous and more beautifully illuminated manuscripts than in the preceding century, specimens of which are still extant. The abbey of Saint Denis created also lovely stained glass windows and mosaics. Some idea of the perfection of mechanical technique reached by the monks is afforded us by the work, ‹Diversarum artium schedula› written by Theophilus, a monk or priest (10th or 11th century), in which he defines the manipulation and gives the formulæ used by the practitioners of the arts among the monks and lay coworkers. He gives perfect and practical information on painting on canvas, wood, vellum, glass, encaustic and fresco, mosaic work, goldsmithing, etc. While to the Rules of Saint Benedict and the assistance later of the Cistercians and Cluniacs in their establishments was due the propagation of art in the Middle Ages, the citizen class arising from the rapid growth in wealth of the civic communities together with the Crusades made a great change in the propagation of the arts. The clericals had not relinquished their efforts to aid the art movement, for they maintained the closest relationship with the arts at least till the Rococo period and practised the work extensively. But the civic lay element, from the 13th century, became stronger and more and more distinguished. Thus, while the monastic orders held supreme domain in the building of churches, the lay body took up the leadership of the plastic arts and painting in the persons of Niccoló of Pisa, Giotto, etc. And with Brunelleschi and Alberti on the scene we find the field of architecture also falling into the hands of civilians, displacing permanently the monastic talent. This was the Trecento period of the early Renaissance. Consult Labarte, J., ‹Histoire des arts industriels au Moyen age et à l'époque de la Renaissance› (Paris 1864); Kraus, F. X., ‹Geschichte der christlichen Kunst› (Freiburg im Breisgau 1896); Springer, A. H., ‹Klosterleben und Klosterkunst› (Bonn 1886); Zouche, R. C., ‹Visits to Monasteries of the Levant› (London 1916). See CHRISTIAN ARCHITECTURE; MANUSCRIPTS, ILLUMINATED.

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MONASTIC ORDERS, Costume of. See COSTUME, ECCLESIASTICAL.

MONASTICISM, or MONACHISM, is a state of life in retirement from the world adopted for motives of religion. It is not peculiar to Christianity, for in many religions, as that of Israel, and in those of India, China and Tibet, the same motive has led men to withdraw themselves wholly or in part from converse with worldly society and to seek in seclusion and retirement opportunity to lead a purer or higher life. The Nazarites, the Rechabites, the Essenes, the Therapeutæ were separatists from society in a greater or less degree, and in this respect were the precursors of the ascetæ of the earliest Christian age and of the hermits or anachoretæ and the cœnobites of the 3d and 4th centuries.

In the middle of the 3d century, during the persecution of the Christians by Decius, Paul of Thebes in Egypt (Saint Paul the first hermit), withdrew to a wilderness, and during the remainder of his long life lived in absolute solitude in a cavern of a mountain, deriving his food and his vesture from a neighboring grove of palm trees. Many others fleeing from persecution or from the contagion of a profoundly corrupt society, flocked to the wildernesses of the Nile country; among them was Antony (Saint Antony), who after many years of the strictly solitary life of an anchorite was in a manner compelled by circumstances to adopt the cœnobite rule. He was by choice an anchorite like Saint Paul the Hermit, but the fame of his virtues and his miracles brought to his cell in a remote wilderness many who desired to devote themselves to the service of God under such a master; and as he could not refuse their prayer he became, in fact if not in name, the Father or Abbot of a pretty numerous cœnobium; hence he is called the Father of Monachism, that is, of the life-in-common of those who retire from the world for reasons of religion; they retain the title of monk, *monachus* (a solitary), though since Saint Antony's day they are no longer solitaries but cœnobites.

Antony's cœnobites occupied each a separate hut or a separate grotto; but Saint Pachomius, a contemporary of Antony, introduced a further development of the community life. The cells or huts were now to hold three brethren; meals were eaten in common; the labor of the monks was regulated; the brethren were graded according to their spiritual proficiency; the community was presided over by an abbot, with inferior officers; in addition to the primitive industries of petty agriculture, basket-making and mat-weaving, the monks practised the trade of the smith, of the tanner, etc.; there were daily assemblies of the community for prayer and conference. When Saint Pachomius died, about the middle of the 4th century, 7,000 monks were subject to his rule.

From Egypt monachism soon spread into Syria, Palestine, Mesopotamia, Asia Minor and Armenia.

The introduction of monachism in the Western countries of the Roman Empire dates from a little after the middle of the 4th century when a few small communities of monks, under the Pachomian rule, were founded at Rome and in Northern Italy. Later, when the rule of Saint Basil had been translated into Latin, communities of Basilian monks sprank up in Southern Italy. Saints Jerome, Augustine and Ambrose were zealous promoters of monachism in Italy and Africa, Saint Martin of Tours in Gaul; when Saint Martin died (397) his body was followed to the tomb by 2,000 monks.

Whether under the Pachomian or the Basilian rule or under modifications of these, monastic establishments multiplied rapidly in the West. But the disorder which attended the decline of the Western Empire and the barbarian invasions, had its effects upon monachism, and the monastery exhibited the same anarchy as did civil society.

Early in the 6th century Benedict of Nursia, who had already led for three years the life of a strict recluse in a cave at Subiaco, about 40 miles distant from Rome, was chosen by the monks of a monastery in the same place as their abbot; but very soon, his new subjects having deposed him, he returned to his solitude and commenced that reform of Latin monachism which made his name illustrious. He gave to his monks a rule which, variously amended and modified, has been the law of the monastic life of Western Europe ever since. In its preamble Benedict recognizes two and only two legitimate classes of monks — cœnobites and anchorites — those who lead the life in common and those who live in solitude — usually now called hermits.

Two other classes he names, but only for condemnation, namely, sarabaites — professing monks who live two or three together without any superior or any fixed rule; and *gyrovagi* or *circulatores,* tramps, wandering beggars who wear the cloak of a religious profession. To do away with these scandals of the monastic life, Benedict's rule requires that the postulant for admission to a monastery shall take in addition to the usual monastic vows of poverty, chastity and obedience, a further vow that he will remain all his days in the community in which he makes his profession, and never be absent from the monastery save by leave of his superior.

Besides monasteries for men Benedict instituted also monasteries for women, and the first abbess of a community of Benedictine nuns was his sister Scholastica.

The Benedictine order was for a long time a powerful agency in the civilization and christianization of the barbarian nations of Europe. Wherever a Benedictine foundation was made there the face of the country was quickly changed: forests were cleared, marshes drained, the arts of husbandry developed, peace and civil order maintained, science and learning fostered, schools, hospitals and refuges established.

Monastic institutions founded in Britain, France, Switzerland, Italy and Germany by Celtic monks prior to Benedict's reform conformed to the Benedictine rule. The Carthusian order, founded in the end of the 11th century, was a reversion to the anachoretic type of monachism — the solitary or eremitical instead of the cœnobitic life. In the same century arose the order of the Camaldoli, another order of hermits.

The beginning of the 12th century saw the rise of that singular development of monachism, the knightly orders, the members of which besides the usual three vows of the monk took a fourth vow, of making war on the infidels for the defense of Christendom. The Knights Hospitallers were originally a religious society bound by vow to harbor in health and in disease pilgrims visiting the holy places in Jerusalem; their house in the holy city was a «hospital» or guest-house. The full title of the Knights Templar is «pauperes commilitones Christi templique Salomonis»— poor knights-companions of Christ and of Solomon's temple. Another military order contemporary with these was the Teutonic order. History records the titles of over 90 military orders or of bodies styling themselves so.

The chronic state of war between Christendom and the Mohammedan power led to the institution of the order of Trinitarians and that of Our Lady of Mercy. The mission of these orders was the redemption out of slavery among the Mohammedans of Christian captives. Bearing the alms and gifts contributed by the charity of Europe, the members of those orders visited the Mohammedan countries on the Mediterranean and procured the liberation of the enslaved Christian captives and restored them to their native countries. The Trinitarians had at one time 250 houses; the Christians redeemed by them, from first to last, numbered over 30,000. The order of Mercy was at first a military order, but in 1218 it put off its military character, and devoted itself wholly to the charitable work of redeeming the captives.

There seemed to be now a sufficiency of religious orders to satisfy all needs. But at this very time, the beginning of the 13th century, two new orders were instituted — and that by Pope Innocent III. who in the Lateran Council had procured the enactment of a decree forbidding the creation of new monastic orders. The new institutes were the order of the Friars Minor (Franciscans) and that of the Friars Preachers (Dominicans); and to these very soon were added two more — the order of Austin Friars (Augustinians) and that of the Carmelites. These are the four mendicant orders, so called because by their rule they renounce all property and all endowments and subsist on the alms of the faithful.

The membership and the establishments of these mendicant orders increased with astonishing rapidity throughout the whole of Europe. Dominican and Franciscan friars were soon the great lights of the theological schools — Albertus Magnus, the Doctor Universalis, as he was styled by his contemporaries, and Thomas of Aquinum, the Angelic Doctor, being the foremost of the Dominican divines, and Duns Scotus, the Doctor Subtilis, and Roger Bacon holding the first rank among the Franciscans. The friars were also effective missionaries both among the poor and the rural populations at home and among the heathen and the infidels.

The Company of Jesus is the latest of the great religious orders; it was founded in 1534 and its mission was to resist the onward march of Protestantism, directly by combating the Protestant assault on the Catholic Church and by instructing the Catholic populations in the grounds of their religious faith and practice; indirectly by organizing a system of higher education for Catholic youth, and offering educational advantages superior to those afforded by Protestant universities and academies. The Company of Jesus took also as its special field of labor the evangelization of the heathen.

Nearly all the later religious orders and institutes have had for their object the Christian education of the young, the reformation of the fallen, or the relief of the poor and distressed; among the orders established for these ends are those of the Nuns of the Good Shepherd, the Sisters of Charity and of Mercy, the Brothers of the Christian Schools, and numerous other congregations.

The Reformation was hostile to monasticism, and in those countries where it obtained, the monasteries were suppressed and the monastic life disappeared. Henry VIII seized upon the monastic properties throughout his realm and applied them for his own religious or secular purposes. In Protestant Germany, Scandinavia and Switzerland, the monastic institution ceased to exist shortly after the triumph of the Reformation. In the 18th century a concertedly hostile movement against monasticism took shape in all the countries under Bourbon rule. The governments of Portugal, France, Spain, Sicily and some of the Italian principalities expelled the Jesuits and brought such political pressure to bear upon the Papacy that Clement XIV reluctantly signed the decree suppressing that famous Society in 1773. Pius VII restored the Society in 1814. During the latter half of the 19th century a recrudescence of hostility on the part of the governments of the Latin countries against the religious orders manifested itself. In Spain, France, Italy, Mexico and some of the South American republics expulsion for some orders and hampering restrictions upon freedom for others have contributed to retard their growth and development. The reasons usually alleged for these coercive measures by these governments are political and economic, the merits of which it would be out of place to discuss here. In the opening decade of the 20th century the French government aimed a deadly blow at monasticism in that country in its Associations Law. Germany admits all the religious orders except the Jesuits. In Great Britain full freedom is now given in the establishment and development of monastic institutions. In the United States, where there are absolutely no legislative restrictions upon the freedom of monastic life, the religious orders are in a flourishing condition. In this country there are 8,400 male and over 50,000 female members of religious orders.

In the Church of England within the last 50 years there has been a revival of the monastic idea with no inconsiderable results. Dr. John Mason Neale and Canon Carter promoted the establishment of sisterhoods (of Saint Margaret and of Saint John Baptist), in which life vows of poverty, chastity and obedience were taken, and a mother house of the Sisters of Saint John Baptist was founded in New York as a branch of the central house in England. There is also the Protestant Episcopal sisterhood of Saint Mary and many others in the United States. Among the male orders of Protestant monasticism must be mentioned the Cowley Fathers, founded by Dr. Benson, and in the United States the Order of the Holy Cross, a preaching order founded by J. O. Huntingdon, son of Bishop Huntingdon. An order of monks was also founded by Rev. Joseph Leycester Lyne in 1870 at Llanthony Abbey, Wales, and the strict rule of Saint Benedict was adopted. It is no exaggeration to say that the monastic movement is now flourishing, both in the Church of England and in its daughter church, the Protestant Episcopal Church in the United States. For further details see the articles on the various orders, Benedictines, Cistercians, etc.

Bibliography.—Allen, A. V. G., ‘Monasticism in its Relation to the Episcopate and to the Catholic Church’ (in ‘Christian Institutions,’ New York 1909); Allies, I. W., ‘The Monastic Life, from the Fathers of the Desert to Charlemagne’ (London 1896); Bertouch, ‘Geschichte der geistlichen genossenschaften’ (Wiesbaden 1888); Butler, E. C., in ‘Cambridge Mediæval History’ (Vol. I, Cambridge 1911); Clarke, W. K. L., ‘St. Basil the Great, a Study in Monasticism’ (ib. 1913); Feasey, H. J., ‘Monasticism’ (London 1898); Gasquet, Francis A. (Cardinal), ‘Monastic Constitutional History’ (ib. 1896); id., ‘Henry VIII and the English Monasteries’ (ib. 1910); Hannay, J. O., ‘Spirit and Origin of Christian Monasticism’ (ib. 1903); Harnack, A., ‘Monasticism: Its Ideals and History’ (Eng. trans., New York 1910); Heimbucher, A., ‘Die Orden und Congregationen der katholischen Kirche’ (Paderborn 1896; 2d ed., 1907); Henrion, ‘Histoire des ordres religieux’ (Paris 1835); Möhler, ‘Geschichte des Mönchthums in der Zeit seiner Entstehung,’ edited by Döllinger (Regensburg 1839); Montalembert, C. F. R. de T., ‘Les Moines d'Occident’ (Eng. trans., 2 vols., London 1896); Morin, L. F. G., ‘Ideal of the Monastic Life Found in the Apostolic Age’ (New York 1914); Smith, I. G., ‘Christian Monasticism from the Fourth to the Ninth Centuries’ (London 1892); Steel, ‘Anchoresses of the West’; id., ‘Convents of Great Britain’; Taunton, ‘English Black Monks’; Weingarten, ‘Ursprung des Mönchthums’ (Gotha 1877); Wheeler, E. R., ‘Women of the Cell and Cloister’ (London 1913); Wishart, A. W., ‘Short History of Monks and Monasteries’ (2d ed., Trenton 1903); Woodhouse, F. C., ‘Monasticism, Ancient and Modern’ (London 1896); Workman, H. B., ‘Evolution of the Monastic Ideal’ (ib. 1912).

MONASTIR, mŏn'ạ-stēr, Africa, a seaport town on the east coast of Tunis on a peninsula in the Gulf of Hammamet. It is strongly fortified with surrounding walls surmounted by towers and has its Kasba (castle), 13 mosques, a high school for the natives and beautiful gardens in the vicinity. Its chief industries are soap-making and oil trade. The town is known locally as Mistir and is the ancient Ruspina. Its population is about 6,000, most of the Europeans being Italians and Maltese.

MONASTIR, or **BITOLIA,** bē-tō'lĭ-ạ, Jugo-Slavia, a city and district of Macedonia (q.v.). The city, 86 miles by rail northwest of Saloniki, is attractively built at the west edge of a plain, in a recess formed by two lofty mountains, and is intersected by a river, crossed by numerous bridges. The streets are wide and well paved; the houses neat and clean; the mosques and minarets picturesque; and the bazars handsome. Before 1912 Monastir was an important centre for military operations by Turkey and was a scene of great activity during the Balkan Wars 1912–13 and after the outbreak of the European War in 1914. The majority of the inhabitants are Greeks and Bulgarians, the Turkish residents being now few in number. It carries on a large trade with Constantinople, Saloniki, Vienna and Trieste. Pop. about 45,000. The district has an area of 10,690 square miles. Pop. about 850,000.

MONAZITE (Greek, «solitary,» in allusion to its rare occurrence), a native phosphate of the metals of the cerium group, often also containing more or less thorium silicate. It is reddish or brownish in color, with a resinous lustre, and crystallizes in the monoclinic system, though it also occurs in massive and granular forms. It is commonly translucent and brittle, with a hardness of from 5 to 5.5, and a specific gravity of about 5.0 to 5.2. It is found at Norwich, Conn., and also in the Ural district, as well as in Australia, Brazil and other parts of the world. The chief commercial supply, however, comes from North Carolina and from certain parts of Brazil. In these regions monazite is a constituent of the granitic rocks, and is obtained by washing the gravels and sand that have been formed by the disintegration of those rocks. The Brazilian output has been controlled by a German syndicate since 1902, and practically all of it now goes to Europe. The monazite produced in the United States comes chiefly from Burke and Cleveland counties, North Carolina. Monazite owes its industrial importance to the cerium and thorium that it contains, the former being utilized for the preparation of cerium oxalate, which is used in medicine and in the arts, while the thorium is employed in the manufacture of mantles for incandescent gas-lighting.

MONBODDO, James Burnett. See BURNETT.

MONCHEUR, môn-shėr, **Ludovic,** BARON, Belgian diplomat: b. Brussels, 12 May 1857. He was educated at Louvain, entered the diplomatic corps, became attaché to the Belgian legation at The Hague in 1883; held posts in the legations to Vienna (1885), Berlin (1887), Rome (1892); became minister to Mexico in 1898; and in 1901 became minister to the United States. He has written on the geography of Mexico and is a member of the Antwerp Geographical Society.

MONCLOVA, mọn-klō'vä, Mexico, a town of Coahuila, the terminus of a branch line of the Mexican International Railroad to Cuatro Cienegas, 100 miles northwest of Saltillo. Monclova dates from the 17th century and was formerly the capital of the dual state of Coahuila and Texas. It has railroad works, cotton factory, stock raising interests, and a trade in the agricultural produce of the region. Pop. 7,000.

MONCRIEFF, mŏn-krēf', SIR **Alexander,** British ordnance expert, inventor of the disappearing gun system: b. Edinburgh, 17 April 1829; d. Bandirran, 3 Aug. 1906. He was educated at Edinburgh and Aberdeen; apprenticed to a civil engineer; served in the Scottish Royal Artillery; during the Crimean War planned the Moncrieff ordnance system, also called the protected barbette, or the disappearing system, for the invention of which he received $50,000 from the British government. The important point in this system is that the recoil of the gun is utilized to drop it out of sight after firing and to raise it again when necessary, a contrivance which did away with the cumbrous and expensive system of steel-plated forts. It substituted for them the simple, inexpensive Moncrieff pits, mere slight excavations for the masking of coast batteries. He received the honor of Knighthood in 1890.

MONCTON, mŭnk'tŏn, Canada, a city and port of entry in Westmoreland County, New Brunswick, at the head of navigation of the Petitodiac River, a tidal stream entering the Bay of Fundy; the Atlantic terminus of the National Transcontinental Railway, 86 miles northeast of Saint John, and 185 miles northwest of Halifax. It has a good harbor and an extensive trade in lumber and produce. The tide in the Petitcodiac estuary is one of the most remarkable in the world, coming in with a bore from four to six feet high and rising (in spring tides) to a maximum height of 60 feet. The offices and chief workshops of the Canadian government railways are here, employing 2,000 men. Enormous quantities of natural gas have been discovered in the vicinity, which are used for light, heating and power, the street railways being run by this means. Moncton was celebrated for its shipbuilding in the days of wooden vessels. Pop. (1921) 17,396.

MOND, mŏnd, **Ludwig,** English manufacturing chemist: b. Cassel, Germany, 7 March 1839; d. 11 Dec. 1909. He was of Jewish parentage, and educated at the Cassel Polytechnic and the universities of Marburg and Heidelberg; went to England in 1862, to enter the employ of the Leblanc soda works, where he introduced his method of recovering sulphur from alkali waste; in 1873 introduced the Solvay process of manufacturing ammonia soda, into England; and continually improved this process. His alkali works at Northwich are the largest in the world. He invented a means of manufacturing chlorine as a by-product of the ammonia soda process, and devised new gas-batteries, new processes for manufacturing nickel based upon his discovery of nickel carbonyl, and a new method of producing gas for power and heating, ammonia being a by-product. In 1896 Mond endowed the Davy-Faraday Research Laboratory at the Royal Institution. His remarkable collection of paintings, bequeathed mainly to the National Gallery, London, has been described by J. P. Richter in ‹The Mond Collection› (London 1910).

MONDAY (*moon* and *day;* Saxon, *Monandæg;* German, *Montag;* Latin, *lunæ dies*), the second day of the week, formerly sacred to the moon. See CALENDAR.

MONDE (LE) OÙ L'ON S'ENNUIE, lĕ mônd oo lôṅ sôṅ'nwè (‹The Society that Bores› 1881), by Édouard Pailleron, is still, what after 15 years it seemed, «on the whole the most brilliant comedy of modern days» (*Athenæum,* 27 Jan. 1906). It is not only an extremely keen and witty satire on the modern Parisian blue-stocking, the counterpart for its day of Molière's ‹Femmes savantes,› but its individual characters stand out so clean-cut that «keys» to it were once in vogue, and many thought to recognize unmistakably some at least of the originals. The outstanding characters are all types easily recognizable in modern counterparts of this society of literary, intellectual, political and social pretense. First is Bellac, the complacent object of admiring adulations, such as the would-be intellectual *Parisiennes* were then bestowing on Professor Caro, who vapors of Platonic love, the better, in his own phrase, to «enjoy life and avoid marriage.» Then there is the soldier-senator bore, General de Briais; the transcendental bore, Saint-Réault; the sentimental, yet shrewdly tart Duchess de Reville, who insists: «The older I grow the more I see that there is no happiness else in the world than love»; her niece, Madame de Céran, the hostess, busybody of intrigue for reputation, and Lucy Watson, the may-pole Englishwoman, who translates Schopenhauer. The better to set these off and spice the whole come the recently-married, gaily sensible Paul and Jeanne Raymond and the delightfully ingenuous young girl Suzanne, vivacious yet tender, sensible yet *gamine,* whose hand one grudges a little to her guardian, the right-hearted but rather slow-witted Roger. Consult Claretie, ‹Édouard Pailleron› (Paris 1883).

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MONDOVI, mōn-dō-vē, Italy, an episcopal city in the province of Cuneo, 58 miles by rail south of Turin. Its chief building is the 15th century cathedral of San Donato crowning the steep height of the upper town. Silk, cloth, paper, pottery, machinery, etc., are among its manufactures, and it has a school of industrial arts and handicrafts. Near the city the Sardinians were totally defeated by Napoleon, 22 April 1796. Pop. 10,000; with suburbs, 19,300.

MONER, the simplest form of protozoan, regarded as the simplest known animal organism, and included among the rhizopods in the order *Lobosa.* One of the forms most frequently met is *Protamœba.* Consult Haeckel, E., ‹History of Creation,› ed. by Lankester (4th ed. 1906).

MONET, mō'nā, **Claude,** French painter: b. Paris, 14 Nov. 1840. He opened a new road to landscape painting by his application of scientific principles deduced from the laws of light. His work, a magnificent verification of the optical discoveries made by Helmholtz and Chevreul, forms the very basis of the Impressionist movement with all its chromatic demonstrations of light and color. Suppression of local color and the study of reflections by means of complementary colors and division of tones by the process of pure, juxtaposed colors are the essential principles of Impression. Monet's first luminous studies date from about 1885. For years he remained unknown.

Light is the real subject of his pictures. He has treated one and the same site in a series of pictures painted from nature at all hours of the day. The most famous of this series are the ‹Hay-ricks,› the ‹Poplars,› the ‹Cliffs of Etzetat,› the ‹Golfe Juan,› the ‹Coins of Rivière,› the ‹Cathedrals,› the ‹Water Lilies› and the ‹Thames.› Monet paints this series from nature. He notes, for example, from 9 to 10 o'clock the most subtle effects of sunlight upon a hay-rick; at 10 o'clock he takes up another canvas; and so on from hour to hour, he follows step by step the modifications of the atmosphere. He finishes almost simultaneously the whole series. He has painted a hay-stack in a field 20 times over and the hay-stacks are all different; and when this series is exhibited the beholder can follow, led by the magic of his brush, the history of light playing on one and the same object, a dazzling display of luminous atoms, a presentation of atmospheric vitality. The shadows, true to nature, are lights where certain tones — blue, purple, green or orange — predominate exactly as happens in optic science.

Usually his subjects or *motifs* are simple; a hay-rick, some slender trees, a cluster of shrubs or group of rocks. No one knows better than he how to place a rock amidst tumultuous waves, how to construct an enormous cliff or how to give the sensation of a group of pine-trees blown and bent by the wind. Most unexpected tones play in the foliage and on the ground. On close inspection the beholder sees the canvas striped with orange, red, blue and yellow touches of the brush, but seen from a distance the freshness of the green foliage appears as in nature. The eye of the beholder recomposes what the painter's brush has analyzed and *dissociated*. Monet is now considered one of the greatest of all landscape painters, ranking with Claude Lorrain and J. W. M. Turner. He understands and depicts with equal facility the true character of every soil and the true character of every kind of vegetation. Monet is also able to turn like all great artists from demonstrations of power to displays of tender charm. His studies of the austere rocks of *Belle-Isle en mer* where heavy waves and blinding spray dash with fury over the granite rocks are unparalleled, while his series of *Water-lilies* express the melancholy and quiet beauty of sequestered pools where the water is thick with tangled stems and sleepy blossoms. Monet has also painted the woods in autumn where the sunlight plays on tones of bronze and gold and red; chrysanthemums, dazzling sun-flowers, tulip-gardens in Holland; sailing boats on sunny rivers; and many portraits and other studies. The series called ‹The Cathedrals› is famous. It consists of 17 studies of the west front of Rouen Cathedral, the towers of which fill the whole space of the picture. The gray stone, worn by time and blackened for centuries, is for 17 times made the theme for the painter's vision. Pale and rosy at sunrise and differently rosy and glowing at sunset, purple at midday, shrouded in mist or ethereal under the moonlight, the superb façade is reconstructed in the boldest way, yet producing the effect of its thousand details of architectural beauty and exhibiting the most dazzling and poetic atmospheric harmonies. Whatever subject he treats Monet creates an æsthetic emotion in the beholder. Consult Duret, ‹Le peintre Claude Monet› (Paris 1878); Van Dyke, John C., ‹Modern French Masters› (New York 1896).

MONETA, in Greek mythology, a name applied to Juno, known as the goddess of coin or money. A temple was dedicated to her in this capacity on the Capitoline Hill, in which the mint was located.

MONETARY COMMISSION OF THE UNITED STATES CONGRESS, a commission appointed in August 1876, by the 44th Congress, to inquire into the causes and economic effects of the decline in silver, the best means for resuming specie payments and other national monetary questions. The commission consisted of three senators, three representatives and three monetary experts. Meetings were held in Washington and New York, during a period of six months. The results of these conferences were published by the government in monographs issued by the Treasury Department.

MONETARY CONFERENCES, International. In addition to the monetary conventions (q.v.) held among European nations, four great International Monetary Conferences have been held, three at Paris 1867, 1878 and 1881, and one at Brussels in 1892. Encouraged by the success of the Latin Union (q.v.), France invited all the powers to participate in a general conference for the purpose of relieving the problems of international exchange. The conference was attended by 18 European nations and the United States, and was presided over by the French Minister of Foreign Affairs. Eight sessions were held, the principal topics of discussion being the uniformity of coinage and the larger problems attendant upon such proposed uniformity. Two important decisions were reached: (1) that it would be more expedient and less expensive to the several nations to adopt as a uniform standard some already existing monetary system than to invent a new standard; and (2) that gold was the only standard which was adapted to international money. The standard of fineness was set at nine-tenths, and the five-franc piece was recommended as the common denominator. It was likewise agreed that all gold coins having this common denominator should have legal circulation in the states mutually bound by the conference. Since no treaties were contracted to bind the members of the conference to their decisions, little was really accomplished. The principal value of the first conference lay in the fact that it opened the way to further discussion.

The second conference was called by the United States by Act of Congress, 28 Feb. 1878, under which the President was directed to invite the nations of Europe to join in a «conference to adopt a common ratio between gold and silver for the purpose of establishing internationally the use of bi-metallic money, and securing fixity of relative value between those two metals.» This determination was occasioned by the fact that the silver production of the United States had assumed immense proportions. Also Germany's use of the gold standard threatened the value of silver money, and it was deemed advisable to establish the ratio between gold and silver before serious depreciation of the value of silver might set in. Twelve countries participated, Germany alone of the great powers refusing to enter into the conference. The United States submitted two propositions, one covering the desirability of the unrestricted coinage of silver and its use as money of unlimited legal tender; and the second, advocating a double standard of gold and silver on the basis of the establishment of a fixed ratio between them. The European powers with the exception of Italy, after much discussion, made answer as follows: «That it is necessary to maintain in the world the monetary functions of silver as well as those of gold, but that the selection for use of one or the other of the two metals, or of both simultaneously, should be governed by the special position of each state or group of states.» They agreed also that bi-metallism must be determined by the discretion of the individual states chiefly in relation to the country's relation to the silver market; and that, in lieu of the fact that a mutual agreement on the question of ratio between the two metals could not be reached, the question had better be dropped for the time being. The conference therefore produced no effective results.

The French and United States governments joined in calling the third conference. The decline of gold production again brought up the problem of bi-metallism. England and France met with seriously diminished gold reserves, and the United States was forced to import gold, which upset the European market. Germany was unable to find a satisfactory means of disposing of her stock of silver. Nineteen countries attended the conference. It recommended the establishment of the 15½ to 1 ratio, and then adjourned for the purpose of giving the various nations time to consider the proposition, with the intention of reconvening on 12 April 1882. However, the conference was not reassembled on that date, and was therefore fruitless.

The fourth conference was called by the United States «for the purpose of conferring as to what measure, if any, can be taken to increase the use of silver as money in the currency system of nations.» Twenty countries were represented. A delay was caused by the fear of a cholera epidemic, and in November 1892, the sessions were finally held. England and the United States were the most enthusiastic members of the group. Political factors began to play also on the interests of these two countries, and the discussion, though lengthy, was altogether unprofitable. Various schemes for a bi-metallic standard and for the wider circulation of silver through some co-operative system were brought forward. There was no unanimity and the conference finally adjourned; 30 May 1893, was the date set for its reconvention, but this never took place. (See MONEY). Consult the various official reports of the conferences; and also ‹Coinage Laws of the United States› (1792–1894); Muhleman, M. L., ‹Monetary Systems of The World› (New York 1895); and Russell, H. B., ‹International Monetary Conferences› (New York 1898).

MONETARY CONVENTIONS, conferences between European nations, for the regulation of their coinage. Two of such conventions have been held, the «Latin Monetary Convention,» and the «Scandinavian Monetary Convention.» The former includes France, Belgium, Italy and Switzerland, the agreement having been made in December 1865, in virtue of which the coinages of those countries are of the same weight and fineness. Greece subsequently joined the convention, and assimilated her drachma to the franc. Spain, Austria and Hungary, Finland, Rumania, Serbia, Bulgaria and Monaco have also coined large amounts of either or both gold and silver money, of weight, fineness and value exactly proportionate to, or identical with, that of the countries included in the convention. Since 2 Aug. 1892, the gold standard has prevailed in Austria, and since 1 Oct. 1897, in Japan. The «Scandinavian Monetary Convention» dates from 1873, and includes Norway, Sweden and Denmark. See LATIN UNION.

MONETITE, a native acid phosphate of calcium, $CaHPO_4$ occurring massive and in small, triclinic crystals, in the islands of Moneta and Mona, in the West Indies. The mineral is found in limestone, beneath a deposit of guano. (Also spelled «monitite.»)

MONEY, Walter, English author: b. Donnington, Berkshire, 21 Aug. 1836. He received his education in a private school and early began to study on historical and archæological subjects, and for a number of years was the local secretary of the Berkshire Society of Antiquarians, London, and of the British Archæological Association. From 1889–97 he was a member of the Berkshire County Council. Among his publications are ‹The History of Newbury›; ‹The History of Hungerford›; ‹The History of Speen — the Roman Spinæ›; ‹Church Goods in Berkshire›; ‹The Two Battles of Newbury, 1643–44›; ‹The Story of the Siege of Donnington Castle›; ‹The Siege of Basing›; ‹A Royal Purveyance in the Elizabethan Age›; ‹A Popular History of Newbury and the Neighborhood› (1905); and many memoirs on historical and archæological subjects.

MONEY. Money is a term used to describe the standard of value and a very important part of the medium of exchange of a country. By a *standard of value* is meant any commodity, which is used to measure and express the ratios in which other commodities exchange for each other. For example suppose wheat has been traded for wood, cattle, sheep and plows on the following terms: 1 cord of wood for 5 bushels; 1 ox for 50 bushels; 1 sheep for 20 bushels; and 1 plow for 10 bushels. The figures 5, 50, 20 and 10 express the market values of these commodities and the ratios at which they should exchange for each other, and, since each refers to bushels of wheat, wheat may be called the standard of value.

Standards of Value.— In a community in which barter was the only method of exchange each person would trade the commodity he produced or the service he rendered for the other commodities and services he required, and would express their values in terms of the commodity or service thus bartered, no other method of expressing their values being available to him. Standards of value in such a community would therefore be individual and would be as numerous as the individual traders, and difficulty would be experienced in discussing values because each person would speak a language not intelligible to others or only intelligible after a mathematical calculation. For example, one man would express the value of a given commodity, say a horse, as so many bushels of wheat, another as so many cords of wood, another as so many yards of cloth, another as so many days of labor, etc. The only method of removing this difficulty would be the acquisition by each member of the community of the ability and the habit of quoting values in terms of the same commodity; that is, by the acquisition of a *community standard.*

Such community standards were early established in every trading group of which history furnishes any record, and, as trade developed between different communities, standards common to wider and wider areas and to larger and larger groups appeared, until, with world-wide trade, we have standards common to many nations. Indeed, at the present time all the nations in which commerce has been highly developed use the same standard, gold, and only two standards, gold and silver, are used throughout the civilized world.

Only a commodity which possesses a high degree of utility for purposes of ordinary consumption can serve as a community standard since only for such a commodity would every person barter his commodities or services, and such barter, as we have seen, is a condition necessarily precedent to service as a community standard. Since several commodities in the same community and at the same time, however, may possess this essential quality of univeral exchangeability, other qualities are also important in the determination of a community's standard. These are high value in proportion to bulk, divisibility, durability, fitness for coinage and steadiness or stability of value. The first four of these are important, because, as will appear later, it is desirable that the standard of value should serve as an element in the medium of exchange, and the fifth because of the relation between the standard of value and prices which will also be explained later. Among several commodities, therefore, for which every person has frequently bartered his commodities or services, the one which possesses these other qualities in the highest degree of perfection will become the community standard. This fact explains the almost universal use of gold and silver for this purpose, and the possession of the first of these qualities, relatively high value in proportion to bulk, and possibly the last one, steadiness and stability of value, in a higher degree than silver, account for the use of gold as a standard in the most important commercial nations of the world.

The numerical expression of the ratios in which goods exchange for the standard of value is called *prices*. Thus in the United States when we say that the price of a bushel of wheat is one dollar, we express the fact that wheat is exchanging on our markets for standard gold at the ratio of one bushel of the former for 25.8 grains of the latter, which amount of gold has been declared in our statutes to constitute a dollar. This being the case, the causes of changes in prices may be grouped under two heads, namely, those affecting the value of the standard commodity and those affecting the value of the commodity the price of which is under consideration, value in this connection meaning not ratio of exchange, but that quality of a commodity which is changed in magnitude by changes in the relations between its demand and supply. The price of wheat, for example, will change when the relation between its demand and supply changes, or when the relation between the demand and supply of gold changes, unless the change in the value of one commodity exactly offsets that in the value of the other.

The phrase standard of value, as used in the preceding sections, should be qualified by the adjective *primary*, in order to distinguish it from standards occasionally used which may be described as *secondary*. In the United States a secondary standard was in use from 1862 to 1879. In the former year the United States government, in order to assist in paying the expenses incident to the war then in progress, issued its notes promising payment to bearer in denominations suitable for circulation as money and made them legal tender in payments between individuals, i.e., decreed by law that the tender of these notes in the payment of financial obligations would constitute discharge of such obligations.

These notes speedily depreciated. That is to say, the people of the United States, and of other countries as well, did not consider them worth, and would not give for them on the open market, the amounts the payment of which was promised on their faces. As a result of this depreciation these notes took the place of coin in the circulating medium of the country, because people could melt down the coins and exchange the bullion for these notes at their depreciated value and with them meet a much greater volume of financial obligations than they could have met by tendering the coins directly. When everybody thus came to tender depreciated notes in the payment of all their obligations, prices were universally quoted in these notes instead of in gold, and they thus became the standard of value of the country.

The dependence of prices upon the value of gold was not, however, thereby in any way broken. What the government promised to pay in these notes was dollars, and dollars meant a certain amount of gold carefully specified in laws enacted by Congress. The value of the notes themselves, i.e., what people were willing to pay for them on the open market, was daily quoted in terms of the gold standard. The notes, therefore, were a *secondary* standard only, gold continuing to serve as the primary standard. Under these conditions prices fluctuated, not only because of changes in the relative value of gold and of commodities, but also because of changes in the degree of depreciation of these notes.

The phrase *medium of exchange* describes the go-between in exchanges now almost universally used in place of barter. Instead of exchanging the good or service we have directly for the one we want, we nowadays exchange it for a third thing which we in turn exchange for what we want and this third thing is called a medium of exchange. A farmer, for example, who comes to market with a load of grain and wants an overcoat does not search for a clothier who not only has for sale the coat he wants, but also wants the grain he has, but he exchanges his grain for coin, or government notes, or bank checks, and transfers these to the clothier in exchange for the coat.

Medium of Exchange.— The explanation of the almost universal practice of using a medium of exchange is found in the difficulties of barter. One of these is to find two persons each of whom has the thing which the other wants and wants the thing which the other has, and is willing to take the precise amount of the thing desired which the terms of the exchange agreed upon would bring him. There would be little commerce if this difficulty could not be overcome, and in overcoming it the medium of exchange has rendered a service essential to the progress of civilization.

In a state of barter also the process of saving is so difficult and expensive as to be practically impossible as a general practice and on a large scale. It is that of hoarding surplus products. In such a state the farmer saves by storing his surplus grain and allowing his herds to grow and accumulate, the manufacturer by piling up goods in his warehouse, the wageworker, not being able to accumulate his services, could only save by exchanging them for such commodities as he might desire to consume in the future and hoarding these. In all these cases, however, the risk that the product hoarded would keep during the savings period, that it could be sold at the end of that period, and that the terms of the sale would be such as to render the sacrifice of saving worth while, would have to be assumed. In the vast majority of cases, these risks would be so great as to more than offset the inducement to save. The losses experienced by people who had attempted saving under these conditions would discourage others, and it is safe to say that few would ever make the attempt. A proper medium of exchange removes all these risks and thus renders saving possible and attractive.

A medium of exchange also promotes borrowing and lending. Without it a person with an unused surplus could aid another with a deficit only by transferring his surplus to him, but unless this happened to be in the precise form needed, which would rarely be the case, it would do the borrower little or no good. On the other hand, with a proper medium of exchange the lender can transfer to the borrower the means of purchasing at any time anything the market supplies, thus enabling him either to satisfy his own immediate wants or to purchase the means of producing wealth.

In order that exchanges may be accurately, conveniently and safely made under all conditions, that is, when the commodities to be exchanged differ widely in quality and value or when they differ very little, when the exchange is to be completed without delay or after a delay of days, weeks, months or years, when the persons between whom the exchange is to be made are face to face or separated widely in space or time, etc., the medium of exchange must represent every conceivable combination or amount of value; must be easily, cheaply and safely transportable from place to place; must be easily recognizable, durable, and certain in value; must be acceptable to all the parties involved in the trade, and must be automatically adjustable in volume to the fluctuating needs of commerce.

In the United States at the present time the medium of exchange must render it possible to make trades in values as low as one cent and as high as millions of dollars, and in every possible combination of amounts between those figures. It must be possible also to make up these amounts in a very short space of time, without long and difficult calculations and without danger of loss. The medium of exchange would be imperfect and quite incapable of meeting the public needs if it did not measure up to this requirement.

Since commerce takes place between people living far apart, in different cities, states and even nations, the medium of exchange must be of such a character that it can be sent through the mails and by express, over the railroads and on steamships, and be carried about in bags, pockets and purses, and it must be possible without danger of loss to transport in these ways all amounts large and small.

The importance of being easily recognized is well illustrated in a busy station where change must be made with great rapidity and where difficulty of distinguishing one element of the medium of exchange from another would render impossible the transaction of the necessary business.

Without elements of great durability a good medium of exchange would be impossible, because the wear and tear necessarily involved is great, and as an instrument of saving it frequently needs to be kept for long periods of time. Certainty of value is also absolutely essential. If there is any uncertainty regarding the value of any element of the medium of exchange, people will either refuse to accept it, in which case it will cease to be a medium, or they will protect themselves against possible loss by charging a higher price for the goods or services exchanged. In either case commerce is obstructed or made impossible.

In order that people may be willing to part with their commodities in return for the medium of exchange, they must be assured that it in turn will serve them in making desired purchases — that is, that the persons who have the goods they want will be willing to accept it in exchange for such goods. This requirement implies the possession of practically universal acceptability in some of the elements of the medium, of acceptability among wide circles in all of them, and of interchangeability between all, such interchangeability enabling the holder of any element which does not possess universal acceptability to exchange it for one which does.

The volume of exchanges in any community varies from time to time. In this and most other countries it varies with the seasons, being greatest in the spring and fall and least in midsummer and midwinter. The medium of exchange should adjust itself to these changes increasing automatically in volume as the volume of exchanges increases, and decreasing automatically under the opposite conditions.

The qualifications required in a good medium of exchange account for the composition of the currencies of modern nations and for the changes which have taken place in the past and which are still in progress. Every such currency consists of elements which from different points of view may be classified as follows: (1) hand-to-hand money, written or printed orders of one party to pay specified sums to another, and book accounts; (2) coin, government notes and bank currency, the latter sub-classified into bank notes and checking accounts; and (3) standard money and credit currency.

By hand-to-hand money is meant those elements of the medium of exchange which perform their service by mere transfer from hand to hand without endorsement or any other formality. In the United States at the present time it includes all our coins, several varieties of governmental notes and bank notes. Under the head of written or printed orders to pay specified sums to specified persons belong bank checks and drafts, postal money orders, express money orders and other similar devices. Some of these can be transferred between other than the original parties by the formality of endorsement. Book accounts are widely used and constitute much the most important element of the medium of exchange of modern nations. Any book account serves as a medium of exchange if directly or indirectly it enables purchases and sales of commodities to be balanced against each other, for example, that of a grocer who credits farmers with the proceeds of eggs, butter, vegetables, and other produce purchased and debits them with their purchases from him, or that of the farmer himself who credits his hired man with the wages agreed to be paid for his services and debits him with house rent, milk, butter, eggs, potatoes, wood and other produce advanced him. Indirectly the checking accounts of commercial banks balance against each other on a large scale the purchases and sales of individuals, communities and nations, and thus constitute the largest element of the medium of exchange of all highly developed commercial nations.

The second of the above classifications is based in part upon the form and in part upon the source of the medium of exchange. The metallic element of the medium usually takes the form of coins, though bullion is also used. Government notes are those issued by the government and for the payment of which it is responsible, while bank currency originates with banks, which are responsible for meeting the obligations involved in its issue. The name *paper money* is frequently applied to government and bank notes to distinguish them from coins. Coins may be sub-classified on the basis of the metals employed in their manufacture into gold, silver, nickel, or amalgam and copper, and on the basis of their relation to each other, into standard and subsidiary.

The basis of the third classification is the presence or absence of the element of credit. Standard coins, that is, those made from the standard of value, are the only ones in which this element is entirely absent. All other coins, all paper elements of the currency and all book accounts which serve as a medium of exchange contain the element of credit in some degree. Our silver coins, for example, are actually worth as bullion much less than the amount stamped upon them and government and bank notes are in and of themselves worth practically nothing. People take them at the value indicated by the stamp upon them only because somebody in whom they have confidence is under obligation to make that value good, the government in some cases, banks in others, specified persons or corporations in others. The term *credit currency* is appropriately applied to all elements of the medium of exchange which circulate at a value greater than the market value of the substance of which they are made because the credit of some government or bank or person or corporation is an essential factor in such circulation.

The maintenance of a medium of exchange consisting of coins made of different substances and of paper elements issuing from different sources is only possible when complete elimination has been made of the interest of anybody and everybody to discriminate in favor of one element and against others. If such discrimination is for any reason profitable, those elements which alone can with profit be used as a medium of exchange will soon be the only ones so used. The others will be devoted to other uses which are more profitable and on this account will disappear from circulation. This fact was observed in the 17th century by Sir Thomas Gresham, director of the English mint, and stated in the form of a law which has since borne his name. «Bad money,» he said, «drives good money out of circulation.»

This law has been brought into operation many times by the circulation in large quantities of worn and clipped coins. When the proportion of such coins becomes large, full weight coins will either be melted down and sold as bullion or clipped and sweated. It was cases of this kind which Sir Thomas Gresham had in mind when he used the adjectives *good* and *bad* in the statement of his law, *bad money* referring to worn and clipped coins and *good money* to full weight coins.

The operation of this law has also been frequently illustrated by the substitution of silver for gold coins and vice versa. In the early part of our history five silver dollars contained 15 times as many grains of silver as did a five-dollar gold piece grains of gold, 15 to 1 in 1793, at the time these coins were first minted, being about the relative values of the same weight of silver and gold. Subsequently the value of silver relatively to gold fell so that it required nearly 16 ounces of silver to sell upon the markets for as much as an ounce of gold. The result was that gold coins completely disappeared from circulation, because they were worth more as bullion than as coin. For the opposite reason, silver remained in circulation and silver bullion was taken to the mint and coined. Later still in our history, on account of a great fall in the value of gold relative to silver, gold coins took the place of silver, the latter being melted down or exported and sold as bullion.

The disappearance of coin as the result of the circulation of depreciated notes is another form in which the truth of Gresham's Law has been frequently demonstrated. During the war between our northern and southern States, both the Federal and the Confederate governments paid a portion of their bills in their own notes payable to bearer, made legal tender and issued in denominations suitable for circulation as money. They very soon depreciated and became a secondary standard of value, and coin of all kinds disappeared from circulation, since on the bullion market they could be sold for these notes at a good premium, and a five-dollar note would pay as many debts or buy as many things as five silver dollars or a five-dollar gold piece.

The terms in which Sir Thomas Gresham stated his law may be objectionable because the phrases *bad money* and *good money* are not accurate descriptions of the forces which crowd some of the elements of the medium of exchange out of circulation and hold others in, but the law itself is as certain in its operation as those of the Medes and Persians. It is really only one form of the expression of a law of much broader application, namely, that all men are prone to make the most of their possessions.

The device of making some coins *subsidiary* to others which are called *standard* and of making the paper elements of the currency redeemable in coin prevents the operation of

Gresham's law and has, therefore, been incorporated into the practice of all commercial nations. (See article CURRENCY). This practice renders it desirable that standard coins should constitute an element of the medium of exchange, since the stamps on the other coins and the paper elements of the medium refer to definite amounts of the standard of value, and their exchange on the markets, rapidly and conveniently at all times and places for precisely these amounts requires that this commodity should be put up in convenient sized and conveniently labeled packages and be widely spread throughout the commercial world. These ends can only be attained when the standard of value is put up in the form of coins and used as a medium of exchange.

The money of a country, which consists of its standard of value and of those elements of its medium of exchange which pass freely from hand to hand by mere act of transfer and without endorsement and which are accepted without question by everybody, is an historical product, and can, therefore, be explained only by reference to its history.

The Monetary System of the United States.— The foundation of the monetary system of the United States was laid in 1792 in which year Congress passed our first coinage act. That act provided for the manufacture of gold coins of the denomination 10, 5 and 2½ dollars, to contain respectively 247½, 123¾ and 61⅞ grains of pure gold; of silver coins of the denominations dollar, half-dollar, quarter-dollar, dime and half-dime, to contain, the dollars, 371¼ grains of pure metal, and the other proportionate amounts; and of copper coins of the denominations one cent and one-half cent. It further provided that the gold and silver coins authorized should be manufactured without charge by the United States mint for any persons who would supply gold and silver bullion of the requisite degree of fineness and that all such coins should «be a lawful tender in all payments whatsoever.»

While the mint ratio of 15 to 1 between gold and silver coins established by this act closely corresponded to the bullion ratio between the two metals in 1792, it no longer did so in 1794 when the mint at Philadelphia was ready to begin operations. At that time the bullion ratio was about 15.37 to 1, and it never again fell to so low a point as 15 to 1. Gresham's law, therefore, operated almost from the beginning and the gold coin disappeared from circulation. Unfortunately the new silver coins did not circulate freely. Pending the construction of a mint and the manufacture of a sufficient quantity of new coin to supply the needs of the country, Congress had authorized the use of several kinds of foreign coins, including the Spanish milled dollars. Since these latter contained more silver than the new American dollars and since both the Spanish and the American dollars were accepted at their face value in both the United States and the Spanish West Indies, with which we were at the time carrying on an active trade, the merchants of Boston, New York, Philadelphia and Baltimore engaged in this trade discovered a source of profit in shipping American dollars to the West Indies and in bringing West Indian dollars home and transforming them into American dollars at the mint.

A remedy for this condition was not successfully applied until 1834, and in the meantime the currency of the country consisted chiefly of notes issued by the banks of which there were two varieties — state institutions and the United States banks — the first one operating in the period 1791–1811 and the second in the period 1816–36. The notes of many state banks were issued in small as well as large denominations, thus in part supplying the need for small change which the scarcity of coin frequently rendered urgent. In the interval between the first and the second United States banks, 1811–16, our second war with England was fought, and the conditions thus created, aggravated by the liquidation of the first United States Bank forced the state banks into a state of suspended specie payments. Their notes depreciated in consequence and coin of all kinds, foreign as well as domestic, disappeared from circulation. The remedy applied was the authorization of the second United States Bank which was charged with the task of securing a resumption of specie payments. President Jackson's war against this bank started during his first administration had reached a stage by 1834, which foreshadowed the certain end of that institution so soon as its charter should expire in 1836 and that fact, together with the discovery of gold in North Carolina and a recollection of the currency difficulties which succeeded the liquidation of the first United States Bank accounts for the passage in 1834 of another important coinage act.

That act lowered the weight of the gold coins by decreasing the amount of pure metal in the eagles from 247.5 to 232 grains, and that in the other gold coins proportionately thus changing the mint ratios between gold and silver coins from 15 to 1 to 16 to 1. The bullion ratio of that time being about 15.73 to 1 gold coin was slightly overvalued at the mint and, therefore, was restored to circulation, but for the same reason, silver disappeared, and a new problem was created, namely that of supplying the country with small change. That problem was solved in 1853 by an act which reduced the half-dollars, quarters and dimes to the status of subsidiary coins by diminishing the amount of metal in them by 7 per cent, by taking away from private persons the privileges of having silver bullion transformed into them at the mint, and by providing that hereafter they should be manufactured only on government account and sold to private persons at par for gold and that in the future they should be legal tender only for sums not exceeding five dollars. The silver dollar was not affected by this act, but its coinage was unprofitable because the bullion necessary to manufacture it was worth considerably more than a dollar.

The acts of 1834 and 1853 together with the increased production and falling value of gold occasioned by the discoveries of new mines in California and Australia gave the country for the first time an adequate supply of specie. The greater part of the circulating medium even during this period, however, was supplied by the state banks, which increased rapidly in number, especially after the removal of the competition of the second United States bank in 1836. This portion of the currency was defective on account of wide differences in the character of the banks which were issuing notes. There was no uniformity in the laws passed in the various States for the regulation of banks, nor in the practices of the banks themselves. The notes of most banks, therefore, enjoyed a local circulation only and the country lacked a uniform credit medium.

The Civil War inaugurated a new era in American monetary history. In February 1862 an act was passed authorizing the government to issue legal tender inconvertible notes in denominations suitable for circulation as money and within a few months these notes had depreciated to such an extent that gold and silver of all denominations disappeared from circulation. The National Banking Act, passed in 1863, provided another form of currency in the form of national bank notes secured by government bonds. These notes, being redeemable in the depreciated legal tender notes of the government, shared their depreciation. State bank notes were forced out of circulation by a 10 per cent tax levied on them in 1865 and have not formed an element of our circulating medium since that time. This combination of government and national bank notes constituted the currency of the country until 1879, on 1 January of which year specie payments were resumed by the government in pursuance of an act passed in 1875.

While the problem of resuming specie payments was being considered in Congress two important coinage acts were passed. That of 1873 dropped the silver dollar from the list of coins authorized to be manufactured, thus completely depriving private persons of the privilege of transforming silver bullion into silver coin at the United States mints, that privilege in the case of half-dollars, quarters and dimes having been taken away from them by the Act of 1853. Silver having fallen greatly in value in 1876 and subsequent years on account of greatly increased production from recently discovered mines in Nevada, the loss of this privilege seriously affected the profits of the owners of these mines, and agitation for the restoration of the free coinage of the silver dollar was started by them in combination with the opponents of the resumption of specie payments, politicians and speculators who saw in the free coinage of silver an opportunity to further their own ends. This combination was not strong enough to force through Congress the free coinage act they wanted, but it was strong enough to force the passage of a compromise measure in 1878 known as the Bland Act which compelled the Secretary of the Treasury to purchase each month not less than two and not more than four million dollars worth of silver bullion and to coin it into silver dollars. This act also originated the silver certificate which has been an element of our currency since that date.

Like all compromises, the Bland Act was unsatisfactory to both parties to the controversy. The advocates of free silver continued their agitation both in and out of Congress, and in 1890 secured a further concession in the form of the Sherman Act, which directed the Secretary of the Treasury to purchase each month 4,500,000 ounces of silver and to pay for it in Treasury notes redeemable on demand either in silver dollars or gold coin at the option of the Secretary of the Treasury. However, since the act declared it to be the policy of the United States to maintain a parity between the two metals at the existing legal ratio, the Secretary was practically compelled to redeem these notes in gold so long as the mint ratio remained above 16 to 1.

The steady injection of a stream of overvalued silver into our currency combined with the obligation of the government to redeem on demand in gold the United States and the Sherman notes helped to create the crisis of 1893 and seriously embarrassed the Treasury during that crisis. The result was that the silver purchase clause of the Sherman Act was repealed at a special session of Congress called by President Cleveland in the summer of 1893 and in 1900 an act was passed providing among other things for the gradual retirement of the Sherman notes and for the establishment of a gold reserve of $150,000,000 to be used for no purpose except the redemption of the United States notes, such notes when redeemed to be retained in the Treasury until they should be withdrawn in exchange for gold coin.

The only noteworthy change in the currency system of the United States since the Act of 1900 was the result of the establishment of our Federal Reserve system in 1913. Under the operation of that system a new element has been added to our currency in the form of Federal Reserve notes issued in exchange for rediscounted commercial paper. This new element has supplied the necessary element of elasticity which our currency previously lacked, since these notes automatically expand and contract in volume in response to the changing needs of commerce. The other elements of our currency are either stationary in volume or fluctuate in response to other influences than currency needs. See BANKS AND BANKING — FOREIGN EXCHANGE, COMMERCIAL PAPER, FEDERAL RESERVE SYSTEM, NATIONAL BANKING SYSTEM, ETC.; BIMETALLISM; COIN; COINAGE; CURRENCY; GOLD; GOLD COINAGE IN THE UNITED STATES; GOLD STANDARD AND GOLD PRODUCTION; LEGAL TENDER; MONEY, PAPER; SILVER.

Bibliography.— Dewey, D. R., ‘Financial History of the United States’ (New York and London); Johnson, J. F., ‘Money and Currency in Relation to Industry, Prices and the Rate of Interest’ (New York 1906); Kinley, D., ‘Money’ (New York 1914); Laughlin, J. L., ‘The Principles of Money’ (New York 1903); Noyes, A. D., ‘Thirty Years of American Finance’ (New York and London 1898); Scott, W. A., ‘Money’ (Chicago 1913); and ‘Money and Banking’ (New York 1916); Sumner, W. G., ‘History of American Currency’ (New York 1884); White, H., ‘Money and Banking Illustrated by American History’ (Boston and New York).

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MONEY, Coin. See COINAGE; NUMISMATICS.

MONEY, Paper, a money issue of a nation or government; a stamped sheet of paper or parchment, given an official value and used as a medium of exchange. Although coins were used before paper money, the latter was known among the ancients. Corn, cattle, iron, leather, cocoa, shells, tobacco and other commodities were all, in point of fact, used as money, in different ages and different countries; but they have long ceased to be so used, by commercial nations. The high estimation in which the precious metals have been held, in nearly all ages and all regions, made it practicable to use them as money. The scarcity of gold and silver, the need of bills of exchange and the want of a money more convenient for the individual to carry, and lastly, the issuance of government credits forced on bankrupt nations, brought about the use of paper money in European countries, and Colonial America early adopted this medium of exchange from the English.

Provincial Paper Money.— In the earliest days of America paper money was first issued by Massachusetts in 1690. The object was not to supply any supposed want of a medium for trade, but to satisfy the demands of some clamorous soldiers. Other issues were subsequently made, partly with a view of defraying the expenses of government and partly with a view of making money plenty in every man's pocket. The ill-judged expedition of the Carolinas against Saint Augustine, in 1702, entailed a debt of £6,000 on that colony, for the discharge of which a bill was passed by the provincial assembly for stamping bills of credit, which were to be sunk in three years by a duty laid upon liquors, skins and furs. For five or six years after the emission the paper passed in the country at the same value and rate as the sterling money of England. To defray the expenses of an expedition against the Tuscaroras and to accommodate domestic trade the legislature of South Carolina established a public bank in 1712 and issued £48,000 in bills of credit, called bank-bills, to be lent out on interest on landed and personal security, and to be sunk gradually at the rate of £4,000 a year. Soon after the emission of these bank-bills the rate of exchange and the price of produce rose, advancing in the first year to 150 and in the second to 200 per cent. By the year 1731 the rate of exchange rose to 700, at which it continued with little variation upward of 40 years. In the year 1723 the province of Pennsylvania made its first experiment of a paper currency. It issued in March £15,000 on such terms as appeared likely to be effectual to keep up the credit of the bills. It made no loans but on land security or plate deposited in the loan office; obliged the borrowers to pay 5 per cent for the sums they took up; made its bills a tender in all payments, on pain of confiscating the debt, or forfeiting the commodity; imposed sufficient penalties on all persons who presumed to make any bargain or sale on cheaper terms in case of being paid in gold or silver, and provided for the gradual reduction of the bills by enacting that one-eighth of the principal as well as the whole interest should be annually paid. These early specimens of provincial paper money were large notes, printed from copper-plates, having engraved borders on three sides. The inscriptions on the bills were in type, with arms or motto engraved in the left side centre. The signatures of the province officials were signed in red ink.

Continental Money.— The first issue of paper money under the authority of the Continental Congress was dated 10 May 1775, but the notes were not actually placed in circulation until the August following. On 31 May 1781 the continental bills ceased to circulate as money, but they were afterward bought on speculation at various prices, from 400 for one, up to 1,000 for one. The value of continental paper was not the same in different parts of the country. The exchange was, for example, at 35 for one in New England, New York, the Carolinas and Georgia, and at 40 for one in Pennsylvania, New Jersey, Delaware, Maryland and Virginia. An account taken from the books of merchants in Virginia shows that the depreciation there regularly followed that in Philadelphia, though, toward the close, it sometimes lagged a month or more behind. Thus when exchange was in Philadelphia at 100 for one, in January 1781 it was in Virginia at 75 for one. As late as May 1781 speculations were entered into at Philadelphia to purchase continental money at 225 for one and sell it at Boston at 75 for one. It is worthy of remark that the depreciation of continental money never stopped the circulation of it. As long as it retained any value at all it passed quickly enough, and would purchase hard money or anything else as readily as ever when the exchange was 200 for one, and when every hope or even idea of its being ultimately redeemed at nominal value should have entirely vanished. The facility of raising ways and means, in the early part of the Revolutionary War, by issues of paper, led to much extravagance in the commissary department and prevented the establishment of a sound system of finance. It is said that when a proposition was before Congress to establish a regular revenue system one member exclaimed, «Do you think, gentlemen, that I will consent to load my constituents with taxes, when we can send to our printer and get a wagon load of money, one quire of which will pay for the whole!»

Connecticut.— Under date of 4 March 1762, Connecticut issued a series of colonial notes of the following values: 9 pence, 1 shilling, 2 shillings and 6 pence, and 10, 20, 30 and 40 shillings. There were 19 regular issues, the last being dated 1 July 1780. There were also three single bills in the nature of treasury notes, the last dated 26 Jan. 1791. Over 100 different bills were issued by this colony. The smaller values were for 2, 3, 4, 5 and 7 pence, issued 11 Oct. 1777. In Connecticut the 6 shilling bill was not infrequently raised by clever counterfeiters to the value of 10 shillings.

Delaware.— In this colony paper money was issued in 1735. One value only of these notes has been preserved; the denomination is 10 shillings. The designs of the early issues are all about the same, a type body with a border of the same and wood cut of the royal arms. On 28 Feb. 1746 a new series was issued of the same general design, but noteworthy from having been printed by the celebrated Benjamin Franklin and his partner D. Hall. On bills of this colony we first get the information that «To Counterfeit is Death,» which is repeated in every possible form. The 2 shilling 6 pence bill of January 1776 issue is adorned with pillars, and probably to show that the edifice supported can stand any sort of usage, one is placed upside down. The last series issued, May 1777, contains bills from 3 pence to 20 shillings, and changed the cut of the royal arms for that of the State. Sixty bills emitted by this colony are known.

Georgia.— The earliest bill printed in Georgia was of the value of 2 shillings 6 pence and was dated 7 March 1749. The Georgia bills were printed on one side of white paper and were usually made attractive by copper-plate vignettes printed in various colors. The vignettes represented figures of liberty, soldier, deer, hog, rattlesnake, palmetto tree, etc. The last issue was dated 16 Oct. 1786. There are over 110 varieties from 3 pence to £5.

Maryland.— The first bill of this colony is dated 1740 and of the value of one shilling. This was followed by a series of five values in 1748 and from then a regular succession of issues until their final extinction in 1781. The design of the early issues may be described as the arms of Lord Baltimore supported by two men in the costume of the day, one with a fish and the other with a spade. This is differently placed on the various bills. The lettering or form of contract is in the following words, «This indented Bill of Eight Dollars shall entitle the bearer to receive Bills of Exchange payable in London, at the Rate of Four Shillings and Six Pence Sterling per Dollar for the said Bill, according to Directions of an Act of Assembly of Maryland, Dated in Annapolis, this 1st day of January, Anno Domini 1767,» followed, of course, by two signatures. The quaint idea of scalloping the end of a legal document to show that it has been prepared with due care and thought and not cut off in a hurry is carried out on these bills. In some values even the word «indented» is printed in a wavy line, and that there should be no mistake as to what is meant by a dollar a minute representation of a Spanish dollar is inserted in the text. The values of the Maryland bills were 3, 4, 6 and 9 pence, and so on up to £3. There were over 100 varieties issued.

Massachusetts.— Prior to 1775, some 13 examples of paper money were issued in this colony. One of these is a copper-plate engraving said to have been the work of the noted patriot, Paul Revere, of Boston. The series was issued by order of the general assembly of the Colony of Massachusetts Bay, 7 Dec. 1775. The reverse of these bills bear the figure of a man in continental dress, with a drawn sword in one hand and a copy of the Magna Charta in the other, above «Issued in defence of American Liberty,» below in Latin, «He seeks by the sword calm repose under Freedom.» The series of 16 Oct. 1776 repudiates the title of Colony for that of State. Coin must have become scarce, as more than half of the denominations are under one shilling. The codfish was the principal design on these bills. The next issue of eight values was of interest-bearing notes which are guaranteed by the United States. Upward of 135 bills were issued by Massachusetts.

New Hampshire.— The design of the New Hampshire bills was usually the British arms with inscriptions in elaborate frames. The earlier issues were type-set. About 60 varieties are known.

New Jersey.— The issues in this colony began in March 1724 and continued regularly to May 1786. In shape the bills were a small, narrow oblong. The high value notes were printed in blue and red. In 1781 the royal arms became the arms of the State, the type reading as follows: «State of New Jersey, Five Shillings, This bill shall pass for Five Shillings agreeably to an Act of the Legislature of this State, passed the ninth day of January, One Thousand Seven Hundred and Eighty-one.» An entire collection of New Jersey bills would number 185.

New York.— The first bill issued was in 1709, and then followed a series ot four dated 18 Dec. 1737. In the next issue the form reads «By a Law of the Colony of New York this Bill Shall Pass current for Three Pounds New York the 20th April 1756.» A set of United States guaranteed notes appeared 15 June 1780.

North Carolina.— The earliest notes were dated 1748, and upward of 120 varieties were printed up to 1780. The most of the North Carolina bills bore motto inscriptions such as «Virtuous Councils the Cement of States»; «A Righteous Cause the Protection of Providence»; «A Lesson to arbitrary Kings and wicked Ministers»; «Liberty and Peace the Reward of Virtuous Resistance»; «Persecution the Ruin of Empires»; «Union of Hearts the Strength of Interests»; «American Virtue Triumphant,» etc.

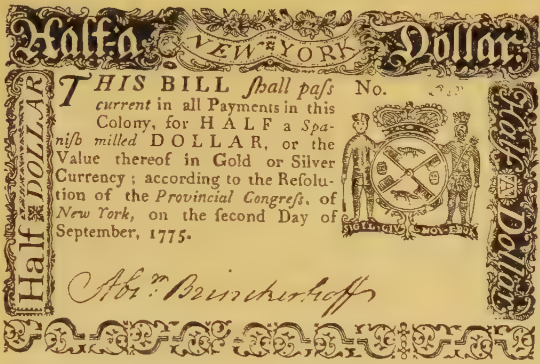
Pennsylvania.— The earliest known bill was dated 10 Aug. 1723 and was printed by Benjamin Franklin. The general style of the notes is the same as used in Delaware, bearing the royal arms, or in 1756 those of William Penn, with his motto, «Mercy Justice.» In 1764 a curious notion was adopted of spelling the name of the colony differently on each bill, thus on the series we find Pennsylvania, Pensylvania, Pennsilvania and Pensilvania. This was perhaps designed as a protection against counterfeiting. On some of the notes issued in 1771 is the signature of Francis Hopkinson, and on the bills of April of the following year that of John Morton, both signers of the Declaration of Independence. In 1777 the shape of the bill changed to the oblong form, and the arms of Pennsylvania took the place formerly devoted to those of Great Britain. This series are found both in black and red with black type. In 1780 a set guaranteed by the United States, of the same design as issued for other States, was put in circulation, and on 16 March 1785 the last of the series saw the light, the denominations running from 3 pence to £4, 16 values in all. The varieties issued by this colony were over 250.

Rhode Island.— The paper money of Rhode Island was similar in design and value to that of Connecticut. The first issue was in 1715 and the last in 1786. There were about 75 varieties.

South Carolina.— There were various notes issued in this colony from 1712 to 1770. The bills dated 6 March 1776 were supposed to have the value of silver, equivalent in currency is given thus, 6 Spanish milled dollars = £9 15s. currency. In 1779 appeared the handsomest notes heretofore used in the country, the backs of the $50, $70 and $90 bills representing Atlas, Prometheus and Hercules being especially noteworthy. The total number of bills for South Carolina was 105.

Vermont.— In this colony there were but two series, the first issued in February 1781 is an ordinary type-printed note, with engraved border on three sides with the State seal about the centre. This consists of a pair of scales

AMERICAN COLONIAL PAPER MONEY



Half a NEW YORK Dollar.

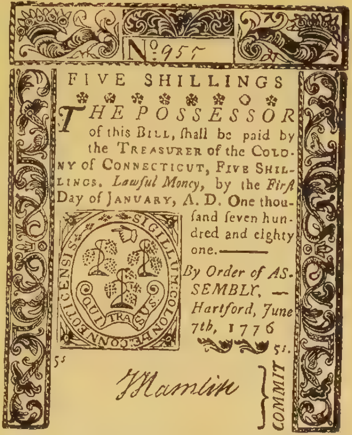
THIS BILL *ſhall paſs current* in all Payments in this Colony, for HALF a *Spaniſh milled* DOLLAR, or the Value thereof in Gold or Silver Currency; according to the Reſolution of the *Provincial Congreſs*, of *New York*, on the ſecond Day of September, 1775.

No.

Half a DOLLAR

Half A Dollar

1



No. 955

FIVE SHILLINGS

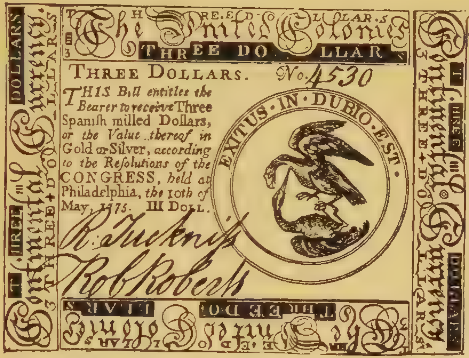
THE POSSESSOR of this BILL, ſhall be paid by the TREASURER of the COLONY of CONNECTICUT, FIVE SHILLINGS. *Lawful Money*, by the *Firſt* Day of JANUARY, A. D. One thouſand ſeven hundred and eighty one.

By Order of ASSEMBLY, — Hartford, June 7th, 1776

5s.

J Hamlin COMMIT

2



The United Colonies

THREE DOLLARS

THREE DOLLARS. No. 4530

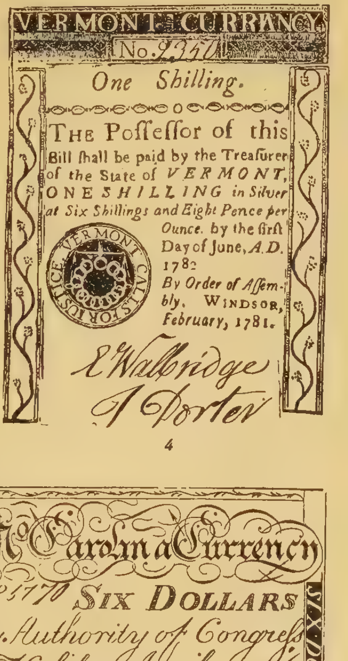
THIS Bill entitles the Bearer to receive Three Spaniſh milled Dollars, *or the Value thereof in* Gold or Silver, *according to the Reſolutions of the* CONGRESS, *held at* Philadelphia, *the* 10th *of* May, 1775. III DOLL.

EXITUS·IN·DUBIO·EST·

Continental Currency

Rob Roberts

3



VERMONT CURRANCY

No. 2350

One Shilling.

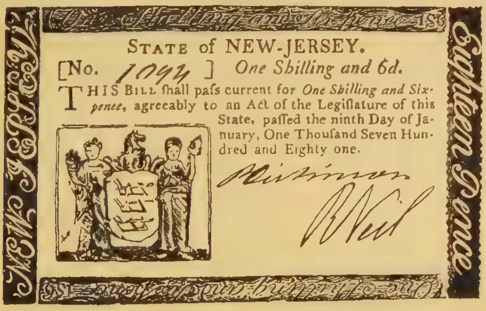
THE Poſſeſſor of this Bill ſhall be paid by the Treaſurer of the State of *VERMONT*, ONE SHILLING in Silver *at Six Shillings and Eight Pence per Ounce.* by the firſt Day of June, *A.D.* 1782

By Order of Aſſembly, WINDSOR, *February*, 1781.

E Walbridge

J Porter

4



One Shilling and Six pence 1S

STATE of NEW-JERSEY.

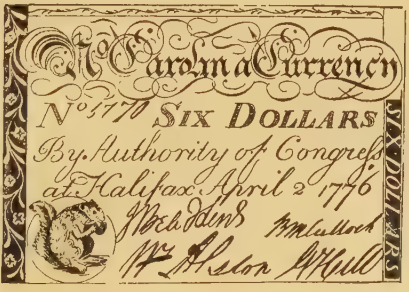
[No. 1094] *One Shilling and 6d.*

THIS BILL ſhall paſs current for *One Shilling and Sixpence*, agreeably to an Act of the Legiſlature of this State, paſſed the ninth Day of January, One Thouſand Seven Hundred and Eighty one.

NEW-JERSEY

Eighteen Pence

5



No. Carolina Currency

No 1770 SIX DOLLARS

By Authority of Congreſs at Halifax April 2d 1776

SIX DOLLARS

Wm. Alston

6

1 New York Province Half-dollar. 1775
2 Connecticut Colony 5 shillings. 1776
3 U. S. Continental Currency, $3. 1775
4 Vermont State Currency, 1 shilling. 1781
5 New Jersey State Currency, 1s. 6 pence. 1781
6 North Carolina Currency, $6. 1776

and a chain of 14 links (the only instance where the number is carried above the original 13) enclosed in a circular band inscribed «Vermont Calls For Justice.» The second issue is in the form of treasury notes, the amounts being filled in with ink.

Virginia.— The first issue for this State was in 1755. The notes are of two varieties, the first a fine, large bill after the English style, and then something between a draft and a bank-bill, being probably made to fill a pressing want. The bills are copper-plate engravings filled out in ink. On the issue of 1775 are the royal arms of Virginia in an engraved frame. The lettering reads «Three Pounds Current Money of Virginia Pursuant to Ordinance of Convention Passed 17 July 1775.» The following year introduces the «sic semper tyrannis» in place of the arms.

Bank Notes.— From the Revolutionary period to the days of the Civil War and to the present time many issues of paper money have been made by the government and by national, State and local banks. See BANKS AND BANKING.

Confederate Paper Money.— During the Civil War the Southern States in secession issued millions of dollars in paper money, beginning in July 1861, with bills of from $5 to $100. On these were designs of the Confederate flag, a train of cars, cotton bales, etc. In September 1861 appeared at least 50 varieties of bills in value from $5 to $100. They were of various designs. A $20 bill showed a head of Alexander H. Stephens in one corner; a $10 bill pictured General Marion offering a breakfast of sweet potatoes to a British officer. Portraits of Davis, Hunter, Memminger, Stephens, Mrs. Pickens, Mrs. Davis, Benjamin, General Jackson and others appeared on the high value notes. There was an issue of $1 and $2 bills in 1862 and in April 1863 appeared a series in value from 50 cents to $100. Some of these bore designs of the capitol buildings at Richmond, Nashville, Montgomery, etc. The last issue of bills from 50 cents in value to $500 appeared 17 Feb. 1864. Many of these are still in existence, and in 1917 some one with an accumulation sold them on the streets of downtown New York at five cents a bill.

Postal Currency.— The United States government printed a paper money as a substitute for fractional currency during the Civil War, owing to the scarcity of silver. This was the suggestion of General Spinner, United States Treasurer under Lincoln, and was commonly known as «shin-plaster» money. The issue was in small scrip of the denominations of 3, 5, 10, 25 and 50 cents. It disappeared from general circulation about 1870.

Greenbacks, Silver and Gold Certificates.— The more recent issues of American paper money in circulation at the present day are printed at the Bureau of Engraving and Printing at Washington. The engravers are specialists, and the figures and intricate designs of their work are often marvels of artistic skill. Portraits of living persons are never put on the notes, and all the figures, vignettes, borders, lettering, etc., are engraved separately before they are put on the plates. First the engraver works out his design and after transferring it by hand to a plate of soft steel the plate is hardened and a soft steel roller takes the impression from it. After this roll is chilled another impression is taken on another steel plate, and after this latter has been hardened it is ready for use. The geometric lathe which makes the border is a complete and wonderful piece of mechanism. The lines for the borders, backs and other conventional designs seen on the notes are made by this machine. The paper for printing the bank-notes is manufactured under the supervision of government officials. It has various lines of short, uneven colored silk threads running through it.

Foreign Paper Money.— The notes of the Bank of England are five by eight inches in dimensions and are printed in black ink on Irish linen water-lined paper, plain, white with ragged edges. The notes of the Bank of France are made of white water-lined paper, printed in blue and black, with numerous mythological and allegorical pictures. South American currency is about the size and appearance of the American, but is commonly inferior in appearance and easier to counterfeit, being produced by a cheaper lithographic process. The German notes are printed in green and black. The Chinese paper money is in red, white and yellow, with gilt lettering and various devices. Italian notes are printed on white paper in pink, blue and carmine and ornamented with a vignette.

Bibliography.— Sumner, ‘History of American Currency’ (New York 1884); Johnson, J. F., ‘Money and Currency’ (Boston 1906); United States Mint, ‘Monetary Systems of the Principal Countries’ (Washington 1912).

MONEY ORDER SERVICE. See POSTAL MONEY ORDER SERVICE.

MONEYWORT, CREEPING CHARLEY, CREEPING JENNY, or HERBTWOPENCE, are popular names for *Lysimachia nummularia* of the primrose family. The plant, which is a native of Europe, is a perennial with roundish leaves and axillary flowers borne from early summer until autumn. It is very popular for planting in rookeries, vases, hanging-baskets and shady situations, and has become naturalized in the eastern United States. Propagation by seeds or cuttings is very simple, and the plants seem to thrive in any moist, shaded garden soil, cool greenhouse, or window. Several other plants are sometimes called moneywort; for example, *Anagallis tenella, Dioscorea nummularia,* and *Thymus chamædrys.* See LOOSESTRIFE.

MONGE, môṅzh, **Gaspard,** French mathematician and physicist: b. Beaune, France, 10 May 1746; d. Paris, 18 July 1818. He was educated at Beaune and Lyons and at 16 was a teacher. He made rapid progress and some valuable discoveries in engineering, and in 1783 was called to the professorship of hydrodynamics in the Paris Lyceum. He was a supporter of the French Revolution, became Minister of Marine and was temporary Minister of War and one of the signers of the death warrant for Louis XVI. He resigned soon after the king's death and was engaged in manufacturing arms and gunpowder for the army. He founded the Ecole Polytechnique under the Directory and was professor of mathematics there, but was later sent to Italy to assist in the removal to France of the art treasures captured by French armies, and there gained the friendship of Napoleon whom he accompanied to Egypt in 1798, continuing his scientific researches. He resumed his position in the Ecole Polytechnique upon his return to France and in 1805 was elected senator. Napoleon gave him an estate in Westphalia, and the title of Count of Pelusium, but the downfall of the emperor resulted in reverses for Monge who was expelled from his positions in 1815. He is renowned principally as the founder of descriptive geometry, and one of the earliest scientists in modern geometry. He published ‘Traite élémentaire de statique’ (1788); ‘Leçons de géométrie descriptive’ (1795). Consult Dupin, ‘Essai Historique sur les services et les travaux scientifiques de Monge’ (1819); Obenrauch, ‘Monge der Begründer der darstellenden Geometrie als Wissenschaft’ (1893–94).

MONGHYR, mŏn-gēr′, or **MONGHIR**, India, the capital of a district in the Bhagalpur division of Bahar, Bengal, on the right bank of the Ganges, 80 miles east of Patna. It communicates by a steam ferry with its railway depot on the opposite bank. It is of great antiquity, and has an elevated fort, enclosing the district administrative offices. Monghyr still enjoys a local reputation for its former important manufactures of swords, firearms and hardware. Pop. 36,000.

MONGOLIA, China, a vast northern central and eastern colonial territory, between lat. 35° and 52° N., and long. 82° and 123° E., bounded on the north by Asiatic Russia, east by Manchuria, south by China proper, and west by Sungaria and East Turkestan; estimated area, about 1,367,600 square miles.

The central portion, nearly a fourth of the whole, is occupied by the Desert of Gobi, an extensive sandy plateau, with a few spots of pasture and brushwood. Other parts are intersected by lofty granitic chains, the principal of which are the Altai, the Thian-shan, the Khinghan, and the In-shan. The largest rivers are — in the north the Salenga, in the south the Shiramuren, and in the west the Irtish. The climate presents the opposite extremes of intense winter cold and summer heat. Agriculture is but little developed, and that only in the south on the borders of China proper; cattle raising, a few domestic industries and the transportation of goods are the chief occupations of the inhabitants. There is a considerable transit trade with Russia and China; the principal commercial centres are Kuku-Khoto, Kalgan, Biru-Khoto, Dolon-nur, and Kuku-erghi, in southern and southeastern Mongolia; Kerulen in the northeast, Kobdo, Uliasutai and Urga, in the northwest. Urga is the principal town, a populous frontier emporium for the caravan trade across the Gobi Desert from China to Kiakhta, Siberia, 170 miles to the north and 100 miles east of Lake Baikal. The chief exports are wool, skins, hides, furs, horns, etc., to an annual value of nearly $5,000,000; while the varied imports amount in value to $7,800,000 annually. The population is estimated at about 2,600,000, divided into tribes chief of which are; (1) the Khalkas, or Mongolians properly so called, who occupy the entire north of Mongolia; (2) the Ouryantai and the Darkhat, who are Mongolized Turks; (3) the Ordos of pure Mongolian blood; (4) the eight tribes of the Tsaktar, of Mongolian blood.

The Khalkas are divided into four «aïmaks,» or principalities, the creation of which, it is said, dates back to Genghis-Khan. These are Toucheton, Tsetsen, Saïn-Noïn, and Tsatsatkou. Each aïmak is divided into «hoshuns,» which are subdivided into «sumuns.» Such distribution of the territory is very ancient.

Although the Mongolians are vassals of China they govern themselves. In each administrative subdivision there is elected a chief, whose election is ratified by the Chinese government, and who receives from Peking a title of honor of slight importance, along with a button or peacock's feather for his cap. At Urga, the seat of the Bogdo Khan the Mongolian prince in charge (theoretically) of the administration of the affairs of the Khalkas has for adjunct (theoretical) a Manchu envoy, the «amban,» who is really the master of the situation; and the decisions made in common (or that are supposed to be) by the two exalted persons are those dictated by the amban, that is to say, the Peking government.

The Khalkas are nomads, but only relatively so. Within the limits of their hoshun and sumun they periodically shift their quarters in search of «pastures new» for their herds of camels, horses and sheep, but they never travel very far, and it is always possible to find an encampment within a radius of a few miles.

They live under the «yourte,» which consists of a light circular framework covered with pieces of felt. The form is that of a dome supported by a small sub-basement, and about 10 feet in height. In order to render it habitable, it suffices to cover it with pieces of felt and close the central orifice above with a movable piece of the same material. Through this orifice the smoke of the «*pot à feu*» escapes. The fireplace is situated in the centre of the abode, the household gods are placed opposite the door, and the housekeeping utensils are arranged along the walls. Around the fireplace are spread out, in lieu of seats, pieces of felt, for which the well-to-do substitute carpets. The princely yourtes are furnished with board floors and decorated with silken hangings.

In summer the men wear wide trousers and a shirt of calico, in most cases blue. Over this they place a long robe, which is buttoned upon the shoulder and side. This is of blue or brown cotton, but sometimes of red or dark green silk. The lamas, or church people — the religion being Buddhism — affect yellow. This robe is gathered in at the waist by a cloth girdle whence, to the right, hangs a knife, and to the left a tobacco bag and tinder box.

Boots with pointed upturned toe and high heel, generally of red leather with a thick sole, complete the accoutrement. The fact that the Mongolian shoemakers make but one size of footgear explains why the son can wear the boots of his father, and why the Mongolian (who also is naturally lazy) does not like to take even the shortest walks afoot. He bestrides his horse in order to travel a distance of a hundred paces, and it is only during the coldest weather that he decides to dismount from his steed in order to walk half a mile or more.

The Mongolians shave and wear a cue. The headgear or national hat consists of a small cone of figured silk or damask, which forms the skull-cap. The rim, which is of black velvet, is turned up so as to describe an acute angle with the central cone. Behind, float two long wide ribbons, which are invariably of red silk. The button or the tuft that crowns the cone is likewise always red. When it rains (a rare event in the Khalka country) the velvet rim is turned down, and the hat assumes the form of an extinguisher that protects the ears and neck. In winter, these hats are replaced by a headgear trimmed with fur, squirrel among the poor, and sable among the rich, the change of hat is accompanied with a change of costume. The long cotton or silk tunic is replaced by a mantle of sheep or deer skin, or among the rich, by a long coat of silk trimmed and lined with costly fur.

The majority of the Mongolians are thin and emaciated. Although they are not strong, they are wiry and capable of withstanding considerable fatigue on horseback. But they object to muscular work. It takes two or three to lift a weight that could be easily handled by one Cossack. To the European eye, they are, with their broad, flat noses, their high cheek-bones, and their little, beady eyes, intensely ugly. They are generally of a low stature, and sometimes have a certain nobility of countenance. Almost all have a kind, benevolent expression to which one soon becomes habituated.

In their youth, the women are prepossessing. Their lineaments are refined, their eyes languishing and their faces plump and smiling like those of the Japanese. They wear the same style of underclothing that the men do; the same boots and the same hat. But the married women wear a long tunic with very narrow sleeves that are generally red from the middle of the arm to the wrist, which is covered by a small point of the sleeve, if the latter is not rolled up. The robe may be blue, brown, violet, or red, but the sleeve is always red. Above the shoulder the sleeve is padded to a considerable height. A tucker of this same red color covers the top of the throat. Maidens, whose robes resemble those of men, wear their hair in a single braid hanging down the back. The children go nude during the summer season, and it is not till they have reached the age of 10 that they are clad in the long national tunic. The name of the Mongolians became suddenly known in the 13th century, and the world was soon filled with the narratives of the exploits of these nomad warriors. The celebrated chief known to history as Jenghis-Khan (or Genghis-Khan) was born probably in 1162. By his ardor, courage and successes he grouped around him a band of young warriors, took part in a number of wars between the Chinese and Mongolians, fighting now on one side and now on the other, subjugated all the tribes living between Irtish and the Khingan Mountains, and in 1206, at the diet of the Mongolian nobles that he had assembled, received the title of Jenghis-Khan, or «the most powerful prince,» under which he was to be known to posterity. Marching from conquest to conquest, he soon became master of the southern provinces of China, and in 1210 made himself master of Bokhara and Samarkand. Seven years later, he died, while his army divided into three parts, one of which marched against Afghanistan, another against Russia and the third completed the conquest of China. In 1237 the whole of Russia, except Novgorod, was paying tribute to the Mongolians, who next invaded Poland and Silesia, and finally Moravia and Hungary. At this period the power of the Mongolians was at its apogee; but, at the end of the 13th century, it declined, and in 1368 these people were driven from China, and the prince who had occupied the Chinese throne returned to the steppes of the north, with his vassals, where he reigned over his fellow countrymen only. A century later, the Mongolians were beaten and dispersed by the Russians, who had been their vassals for two centuries. Subsequently, the Khans of southern Mongolia acknowledged themselves vassals of the emperor, Son of Heaven, the «Bogdo-Khan.» Northern Mongolia, that is to say, the country of the Khalkas, divided into four principalities, remained independent for a longer time, but in 1691 placed itself under the protection of the emperor of China. Soon after the Chinese Revolution in 1912, Outer Mongolia declared its independence which was recognized by the Russian Government in a convention and protocol signed at Urga, 3 Nov. 1912. On 5 Nov. 1913 at Peking, Russia and China reached an agreement to recognize Outer Mongolia as territory under Chinese suzerainty, China recognizing its autonomy. Frontier and other questions were settled June 1915, at a tripartite conference between Mongolians, Chinese and Russians.

Consult Bulstrode, B., ‘A Tour in Mongolia’ (London 1916); Carruthers, D., ‘Unknown Mongolia’ (London 1913); Gilmour, J., ‘Among the Mongols’ (London 1888; 1893); Podsnéeff, A., ‘Mongolia and the Mongols’ (7 vols., Saint Petersburg 1896).

MONGOLIAN RACE, a general name applied to a majority of the people of Asia. In ethnology, the term is used for one of the five great races of the world discriminated and named by Blumenbach, and adopted by Cuvier when he reduced Blumenbach's five to three. The head of the Mongolian is square; the face flattish, nearly as broad as long, the parts not well distinguished from each other; the eyelids narrow, obliquely turned up at their outer angle; the space between the eyes flat and broad, the nose flat, the cheeks projecting, the chin somewhat prominent. The hair is straight, the color black, that of the face and body yellowish (sometimes inaccurately called olive, which implies an admixture of green). The race includes not merely the natives of Mongolia properly so called, but the Tartars, the Chinese, the Japanese, the Cochin Chinese, the Burmese, the Tamuls, the Turks, and the Finns. See ETHNOLOGY.

MONGOLIAN SUBREGION. In zoogeography, a subdivision which includes the tablelands of central Asia, from the Caspian Sea to Japan. Its separation from other Asiatic faunal regions is mainly on ornithological grounds, and is neither distinct nor important.

MONGOOSE, MONGUSE, etc. See MUNGOOS.

MONICA, Saint, mother of Saint Augustine (q.v.): b. Africa 332; d. Ostia 387. A Christian who, in accordance with the wishes of her parents, also Christians, married a pagan. She devoted nearly all her life to the conversion of her husband and son Augustine. Her self-sacrifice was at last rewarded; her husband, Patricius, became a Christian, and Augustine, seeing the error of his ways, reformed. After the baptism of Saint Augustine at Easter, 387, she set out with her two sons for Africa. Arriving at Ostia she became ill and here died. A friend asked her in Ostia if she were not afraid to be buried in a place so far from her own country. She replied: «Nothing is far from God.» Her eminent son preserved many of her holy sayings which he often repeated in his sermons. In the Roman Catholic Church she is regarded as the model and patroness of wives and mothers. Her feast is 4 May. In 1430 her relics were brought to Rome, and were later deposited in the Church of Saint Augustine. Consult ‘Saint Augustine's Works’ edited by Tillemont; Butler, ‘Lives of the Saints.’

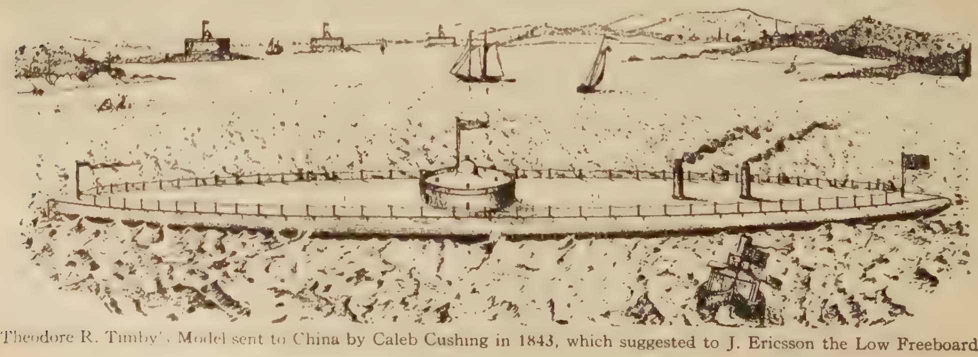
MONIER-WILLIAMS, Sir Monier, English Sanskrit scholar: b. Bombay, 12 Nov. 1819; d. Cannes, France, 11 April 1899. He was a son of Monier-Williams, surveyor-general. He was educated at Oxford, and was for a short period a student at the East India College, Haileybury. He was professor of Sanskrit at Haileybury from 1844 to the extinction of the college in 1858, and in 1860 became Boden Sanskrit professor at Oxford, a post which he held till his death. Among his numerous works are ‘Practical Sanskrit Grammar’ (1846); ‘English-Sanskrit Dictionary’ (1851); edition with notes, translations, etc., of the Sakuntalā (1853); ‘Introduction to Hindustani’ (1858); ‘Indian Epic Poetry’ (1863); ‘Sanskrit-English Dictionary’ (1872; 2d edition 1899); ‘Indian Wisdom’ (1875); ‘Hinduism’ (1877); ‘Modern India and the Indians’ (1878); ‘Religious Life and Thought in India’ (1883); ‘The Holy Bible and the Sacred Books of the East’ (1886); ‘Brahmanism and Hinduism’ (1889); ‘Reminiscences of old Haileybury College’ (1894). He traveled extensively throughout India in order to study the native religions, and to further his scheme of an Indian institute, which he succeeded in getting established at Oxford.

MONISM, a philosophical term which may be briefly translated by «doctrine of unity.» The word was coined by Christian von Wolff, a German philosopher of the first half of the 18th century, and is derived from the Greek monos which means «single; alone; lonely; unique; existing in only one copy.» Wolff, the inventor of many happy terms that acquired currency in philosophy, introduced the word to characterize such philosophies as recognized the existence of one ultimate form of reality only, be it spirit or matter, and he contrasted it with «dualism,» that is, doctrine of duality, held by all those thinkers who believe that both spirit and matter are ultimate forms of existence. Monism is also opposed to a view like that of Leibnitz, which maintains the existence of many substances; the latter is called *pluralistic.* The word «monism» has come to be applied to views maintaining a unity of a non-substantial nature. It has been adopted as the label of a certain type of positivistic theory that emphasizes the owners of things. (See Dualism and Pluralism). Consult Haeckel, E. H., ‘Riddle of the Universe’ (New York 1900); Walker, W. L., ‘Christian Theism and Spiritual Monism’ (New York 1906); Worsley, A., ‘Concepts of Monism’ (London 1907). Discussions of monism will also be found in any of the numerous introductions to metaphysics.

MONITEUR, mō-nē-tėr, **Le,** French journal, established 5 May 1789 by Panckoucke under the name *Gazette Nationale, ou le Moniteur Universel.* Under the title of *L'Ancien Moniteur* the issues for 1789–99 were published in 32 volumes by Gallois (Paris 1840–45). In 1800 the *Moniteur* published the official Actes du government. The name in 1811 was changed to *Moniteur Universel.* Four years later the government publications were omitted from the paper and printed separately in the *Journal Officiel.* Its policy again changed and it continued as the government organ until 1868, when the *Journal Officiel* was again published separately.

MONITITE. See Monetite.

MONITOR, The, an ironclad, the first of a class of naval vessels designated as monitors (see Warships). It was designed and built for the United States government in 1861–62 under direction of the engineer John Ericsson (q.v.), who adopted as the most essential feature of its construction the revolving gun-turret devised by the American inventor, Theodore Ruggles Timby (q.v.). The *Monitor* was launched at Greenpoint, L. I., 30 Jan. 1862, only 100 days after the laying of her keel. She put to sea 6 March following, under command of Lieut. John L. Worden (q.v.), arriving on the night of the 8th at Hampton Roads, Va. Extraordinary energy had been displayed by the builders to meet a grave emergency of the government, then weak in naval resources, for making effectual the blockade of Southern ports



Theodore R. Timby's Model sent to China by Caleb Cushing in 1843, which suggested to J. Ericsson the Low Freeboard.

which President Lincoln had proclaimed, as well as for aggressive action and coast-defense. This emergency soon became a dire peril which threatened the destruction of the Union through superior sea power acquired by the Confederacy with foreign aid or connivance. How this danger was first averted is shown in the account of the famous action in Hampton Roads (see Monitor and Merrimac).

The *Monitor* was built by a company of men, John F. Winslow and John A. Griswold of Troy, N. Y., and their associates, who were actuated by patriotic motives. With T. R. Timby, who had taken out patents «for revolving towers for offensive or defensive warfare whether placed on land or water,» they entered into a contract for the use of his inventions covering the revolving turret, paying him $5,000 as royalty on each turret constructed by them. They built the *Monitor* at their own risk, Winslow and Griswold furnishing 90 per cent and C. S. Bushnell of New Haven, Conn., 10 per cent of the cost. Ericsson, for his services as engineer, received 5 per cent of the gross sum paid to the company for the *Monitor* and kindred vessels built by them. A contract with the government was made by the company and Ericsson, and the government paid for the *Monitor* $275,000, the actual cost being $195,000.

Ivory model of the turret made by T. R. Timby in 1841; now in possession of the Patriotic League of the Revolution.

The contract with the government provided for the building of «an iron-clad, shot-proof steam battery of iron and wood combined,» and the hull of the *Monitor* was of iron with wooden deck beams and side-projection. Her dimensions were:

Extreme length	172 ft.
Extreme breadth	41 ft. 6 in.
Depth of hold	11 ft. 4 in.
Draft	10 ft. 6 in.
Inside diameter of turret	20 ft.
Height of turret	9 ft.
Thickness of turret	8 in.
Thickness of side-armor	5 in.
Thickness of deck-plating	1 in.
Diameter of propeller	9 ft.
Diameter of steam cylinders (two)	36 in.
Length of stroke	2 ft. 2 in.
Displacement	1,255 tons

Armament, two 11-in. shell-guns, each 15,668 pounds.

In all the models, drawings and plans of his invention made by T. R. Timby himself, the pilot house or «lookout» was placed on top of the turret. «For some inexplicable reason,» he has said, «the *Monitor* had her pilot-house placed upon the deck, forward of the turret, in the way of her own guns.»

The success of the *Monitor* aroused much interest in all maritime nations, and was the direct cause of many modifications in the construction of vessels in the navies of Europe, though nowhere except in the United States navy was the monitor adopted as a distinct type of warship. During a gale off Cape Hatteras, 31 Dec. 1862, the *Monitor* was sunk.

John H. Clifford.

MONITOR LIZARD, the type of a family of pleurodont lizards (*Varnidæ*). They are found in Africa, the Eastern Archipelago, etc., and are the largest of modern lizards, some species attaining a length of six or eight feet. The skin is covered with very small juxtaposed scales and tubercles dorsally, while ventrally the scales are square and arranged transversely. The tail is long, cylindrical in the terrestrial, but compressed laterally in the aquatic forms, and possesses a sharp underridge or keel. The limbs are well developed and the toes provided with claws. Most of these great greenish-gray lizards inhabit rivers and ponds, and are active and fierce enemies of all lesser aquatic life. They feed upon eggs and young of crocodiles, turtles and aquatic birds; and on fishes, amphibians, swimming-birds, anything in fact, small enough to be mastered. There is one genus and nearly 30 species. The most familiar species, probably, is that of the Nile and other African rivers (*Varanus niloticus*), upon which the English name «monitor» was first fastened by a ridiculous misinterpretation of the Arabic word *ouaran* (lizard); it is aquatic and frequently exceeding five feet in length. An equally well known kind is the East Indian monitor (*V. salvator*), which is to be met with from Ceylon and western India to the Philippines, and is equally at home in the water, on land or in trees. Its rapacity is great and varied; and it is connected with many extraordinary rites and superstitions among the natives, some of which are given in Fennent's 'Sketches of the Natural History of Ceylon' (1861). Australia has a large species (*V. gouldi*).

MONITOR AND MERRIMAC. The contract for the construction of the *Monitor* was entered into by the Navy Department in the hope that she could be completed before the *Merrimac,* then building by the Confederates at the Norfolk navy yard, could be finished, and that the *Monitor* would be able to cope with this formidable ironclad. The *Merrimac,* called by the Confederates the *Virginia,* was being reconstructed upon the hull of the United States frigate *Merrimac,* of 3,200 tons, which had been sunk, when the Norfolk navy yard was abandoned, by the Union forces, and was subsequently raised by the Confederates. Her armament was two 7-inch rifles, two 6-inch rifles and six 9-inch smooth-bores.

Each side was aware of the effort of the other to be first ready for active service. The Confederates won by a day. At noon 8 March 1862, the *Merrimac,* attended by two gunboats, *Raleigh* and *Beaufort,* each one gun, was discovered coming out of the Elizabeth River into Hampton Roads (q.v.) and standing toward the Union fleet off Newport News and Fort Monroe, composed of the steam-frigates *Minnesota, Roanoke* and *Congress,* each 50 guns; the sailing-frigate *Saint Lawrence,* 12 guns, and the sloop *Cumberland,* 24 guns. Their armament was mainly 8-inch and 9-inch guns, with several 10-inch pivot guns. These vessels had the heaviest batteries which the government had been able to assemble to watch the *Merrimac.* The latter bore down directly upon the *Congress* and *Cumberland.* At less than a quarter of a mile the *Congress* delivered her broadside, her heaviest shot making no impression. The return-fire of shells crashed through her sides with terrible effect. Passing the *Congress* at 300 yards, the *Merrimac* received the fire of the heaviest guns of the *Cumberland* without the slightest harm resulting, and without replying she drove her iron prow through the side of the Union frigate, crushing it, and at the same time pouring in a fire of shells. Leaving the *Cumberland* rapidly sinking, the ironclad steered for the *Congress,* which had been run ashore, and from a point 150 yards astern raked her decks with shells which caused general destruction and set the ship afire. The *Congress* was obliged to surrender. The *Cumberland* fired a broadside as the water reached the gundeck, and went down with her flag flying. As she sank, the Confederate steamers *Patrick Henry,* 12 guns, and the *Jamestown,* two, came out of the James River and joined the *Merrimac.* The *Minnesota* had grounded where the *Merrimac* could not approach within a mile, and her firing was so bad that only one shot struck the frigate. The other Confederate vessels were finally driven off after inflicting much damage with their rifled guns. After several hours' ineffectual attempts to reach the *Minnesota,* the *Merrimac* and attending gunboats returned to Norfolk. Several shore-batteries which had attempted to help proved as useless as the batteries of the frigates had been. The *Congress* continued to burn, and finally blew up. Over half the crew of the *Cumberland* were lost. The crew of the *Congress* were made prisoners, but, with the exception of the officers, were released. The total loss was some 250, the Confederate loss was nominal. The battle of an afternoon had ended the day of wooden navies.

The reports of the destruction by the *Merrimac* caused consternation at Washington, and in the coast cities and, indeed, throughout the North. Secretary Stanton ordered all preparations made for obstructing the channel of the Potomac far below the capital, and warned those in charge of coast-defenses to use every means that could be devised for protection.

Meantime the *Monitor,* in command of Lieut. John L. Worden, had left New York and after a rough voyage entered Hampton Roads at 9 o'clock the night after the battle. At 2 o'clock on the morning of the 9th she had anchored alongside the *Minnesota.* At 6 o'clock the *Merrimac* appeared bearing down on them, but at first passed by, gained the channel in which the *Minnesota* lay, and then steamed directly toward her. The *Monitor* swept in between the two and steered for the *Merrimac.* At close quarters the latter brought her bow-guns to bear and missed. There was little to fire at except the low turret with a cross-section of 20 feet. The first reply of the *Monitor* was a solid 11-inch shot which shook the *Merrimac* from stem to stern. The answer was a broadside, some of the shot of which struck the turret, either glancing or falling as harmless as the shot of the frigates the day before had proved against the *Merrimac.* Then followed broadside after broadside without producing the slightest effect on this «cheese-box on a raft,» as spectators described it. At every opportunity of maneuver the *Monitor* closed in and smote with her 11-inch solid shot, bending the heavy armor and straining the timbers of her adversary. Finally the *Merrimac* left the *Monitor* and crowded steam for the *Minnesota.* Upon reaching point-blank range she received a full broadside, and a shot from a 10-inch pivot gun, without suffering the slightest damage. In reply she raked the *Minnesota* with a shell, set her afire, blew up a tug alongside, and but for the *Monitor,* which had followed under full steam, and now swept in between the two, the *Minnesota* would have shared the fate of the *Congress* and *Cumberland.* In changing position to meet the *Monitor* the *Merrimac* grounded, and the *Monitor* continued her hammering with 11-inch shot. As soon as the *Merrimac* was floated she started rapidly down the bay, pursued by the *Monitor.* Suddenly she turned and attempted to run the *Monitor* down. The blow she struck with her prow glanced, and the *Monitor* was unharmed. The *Merrimac* then started for the *Minnesota* for the purpose of ramming her; but when within easy range the *Merrimac,* with all the Confederate ships, changed course at noon headed for Norfolk. Her officers subsequently gave as a reason that in attempting to ram the *Monitor* her iron prow was broken, and their vessel was leaking. The armor was reported damaged, the stem twisted, the muzzles of two guns shot away and the steam-pipe and smokestack riddled. The casualties were only two killed and 19 wounded. The consternation of the day before at Washington and the North was transferred to Richmond and the South. Preparations were hastily made by the Confederates for blocking the channels in the Elizabeth and Nansemond rivers, and to obstruct the channel of the James.

The *Merrimac* did not again engage the *Monitor,* and after the evacuation of Norfolk, which occurred 9 May, she was destroyed by the Confederates.

The *Monitor* had hurried direct from her shipyard to Fort Monroe and fought without a previous trial-trip, and before she had been accepted by the government. Her five hours' battle settled many questions, and once again in American history had been fired a «shot heard round the world.»

MONITORIAL SYSTEM. See LANCASTERIAN SYSTEM.

MONK, mŭnk, or **MONCK, George,** DUKE OF ALBEMARLE, English general and naval commander; the restorer of the Stuart dynasty: b. Potheridge, Devon, 6 Dec. 1608; d. Newhall, Essex, 3 Jan. 1670. At 17 he enlisted and served in the Cadiz expedition under Sir Richard Grenville, a relative; then entered the Dutch army; and returned to England in 1639, fought brilliantly in Scotland and after 1640 in Ireland, and on the outbreak of the Civil War kept his commission in the king's army. But in 1644 he was captured by the Parliamentarian forces, and after two years' imprisonment in the Tower, joined the victors, for whom he went to Ulster as governor. Accused of exceeding his powers by arranging a truce (which was almost an alliance) with Owen O'Neil, he was recalled to England in 1649 and reprimanded at the bar of the House of Commons. At the victory of Dunbar in 1650 he did good service; a year later he was made lieutenant-general of the ordinance and in Cromwell's absence was commander-in-chief of Scotland. In 1652 he was made a general of the fleet. He introduced the elements of land tactics into naval formation and administered two crushing defeats to the Dutch, van Tromp being killed in the latter battle. In 1654 he again was sent to Scotland on the Royalist rising as commander of the army, and acted there with much more prudence and success. After Oliver's death and Richard Cromwell's resignation Monk set himself to effect the Stuart Restoration, quietly shifted the forces in England until all was so arranged that there was no chance of armed resistance, and then (1660) brought back Charles II — a bloodless revolution meeting with general favor. He was made Duke of Albemarle, received other high honors, maintained order and showed rare courage in London during the Plague, but with an empty treasury in 1667 could not keep the Dutch from burning the shipping in the Thames. Short, fat, fair and wrinkled, Monk was not a winning personality, being cold, prudent past a virtue and rather unprincipled; but he was a wonderfully able general, with technical skill rare in one so lacking in theoretical training. His life was written by his chaplain, Dr. Thomas Gumble (1671). Consult also the biographies by Guizot (1838 and 1850); and that by Corbett, J., in the 'English Men of Action' series (New York 1889).

MONK, a bird. See FRIAR-BIRD.

MONK. See MONASTICISM.

MONK-FISH, ANGEL-FISH, or **FIDDLE-FISH,** a broad, flattened fish (*Squatina angelus*), closely allied to the sharks, but more like a ray in appearance, five or six feet long, having enlarged, wing-like pectoral fins. It is found near the coast in the warm seas of Europe and North America; it usually stays near the bottom, is from three to four feet long, slow in motion, dull, voracious and useless, except that some shagreen may be obtained from its skin.

MONK-SEAL, a seal of the genus *Monachus,* so called from a humorous suggestion in colors to the habit of a monk, the species properly so called is that (*M. albiventer*) of the Mediterranean; but the West Indian seal (*M. tropicalis*) is very similar to it, and is of interest as being almost extinct. See SEALS.

MONKEY-BREAD, the fruit of the baobab tree (q.v.).

MONKEY-FLOWER, any of many plants of the genus *Mimulus* (figworth family), so called because the face of the fox-glove-like corolla suggests that of a cheerful monkey. They are erect, tall herbs, with opposite, clasping, lanceolate dentate leaves, which bear in late summer solitary, axillary irregular blossoms of showy colors. The genus contains some 50 North American species, of which the most familiar is the square-stemmed of the Eastern and Central States (*M. ringens*). Its flower is violet. A common species in California and on the Pacific Coast (*M. guttatus*) has the corolla yellow, often blotched with red or purple.

MONKEY-POT, the fruit of a forest tree of Brazil. See BRAZIL NUT and SAPUCAIA NUT.

MONKEYS, a general name for the animals of the highest mammalian order, the *Primates* (q.v.), excepting mankind and the lemurs; ordinarily also excepting the anthropoid apes (see APE) and the baboons (q.v.). The term in fact, then, is suitably limited to three families, considered in their broadest sense, the *Hapalidæ, Cebidæ* and *Cercopithecidæ.* General characters are as follows: the short hallux, or great toe, is opposable to the other digits of the foot, so that the feet become converted functionally into hands. The pollex, or thumb, of the fore limbs may be absent, but when developed it is usually opposable to the other fingers. These animals may thus be called «four-handed» or quadrumanous; hence the old designation *Quadrumana.* The limbs are nearly of equal length. There is only one pair of mammary glands, which are pectoral in position. In many cases the cheeks are dilated into pouches. The teeth consist of two incisors in each side of each jaw. The premolars, or false molars, vary in number. The true molars number three in each side of each jaw, the latter teeth being furnished with tubercles of various sizes and shapes, adapted for crushing fruits and vegetables. The canine teeth are generally strong and of large size. A *diastema* or interval exists between the lower canine and the first lower premolar tooth, and between the upper canine and outer incisor teeth; this interval admitting of the large canines being brought into apposition when the jaws are closed.

For information as to the probable descent and geological history of monkeys, see PRIMATES.

The small American monkeys of the family *Hapalidæ,* more usually called marmosets (q.v.), seem to be lowest in the scale of structure and nearest the lemurs, and are by some naturalists separated from the *Cebidæ* in a group *Arctopithecini.* They are least in size of the race, have the tail long, hairy and not prehensile; no cheek-pouches or natal callosities; the fore limbs shorter than the hind ones; the thumb not opposable; the ears hairy and of large size; the body covered by a close fur. Their dental formula gives four incisors, two canines, six premolars and four molars in each jaw — this dentition resembling that of the Old World monkeys, and also that of man himself. The molars are provided with blunt processes. They are confined to tropical America, and wholly arboreal, feed on insects and fruit, and are tamable, gentle and intelligent. See MARMOSET.

Next to these come the *Cebidæ,* called New World monkeys, because the family is confined to the American continent, and also known as *Platyrhini,* because of the broad partition in the nose, which widely separates the nostrils and causes them to open somewhat laterally, though this term is often applied to the *Hapalidæ* also. They are characterized by the possession of an extra premolar on each side of each jaw; and by the length and strong prehensility of the tail in most forms — an arrangement by which the end of the tail (naked there on its underside) curls without effort around a limb and clings firmly to it, giving so great assistance in climbing that many of these monkeys exhibit wonderful agility among the trees, grasping and swinging by their tails alone, leaving all four feet (or hands) free. The ears are rounded and with most of the face are destitute of hair, there are no cheek-pouches or callosities on the buttocks, so characteristic of the Old World forms. The hind limbs are generally the longer in this section. In the spider monkeys, however, the fore limbs are longer than the hinder members. The thumbs are not generally opposable, and may be wanting; and the thumb in these monkeys nearly approaches the other fingers in size and form when present. Unlike other monkeys, they have the thumb placed in nearly the same plane as the other fingers, so that the mere position of the thumb renders it unfitted. The great toe is generally of large size, and is more capable of being opposed to the other digits than the thumb. The diet is mainly of a vegetable nature, and their life almost exclusively arboreal, a fact which, more than any question of climate, seems to limit them in range to the region of the tropics, between the plains of northern Mexico and those of southern Brazil, since several species dwell in the cold regions of high mountains. Of the *Cebidæ* the spider-monkeys (*Ateles*) present very typical examples. In these forms the tail reaches its greatest development as a prehensile organ. The limbs are exceedingly slender, and the thumb is rudimentary. (See SPIDER-MONKEY.) The capuchin monkeys, or Sapajous (q.v.) form the type of the genus *Cebus*, and include many species, as also does the genus *Callithrix* (see SQUIRREL-MONKEY). The howling monkeys (*Mycetes*) are so named from the loud howling noises they are capable of producing, through the possession of a bony «drum,» which opens into the larynx, and which greatly increases the resonance of the voice. Other genera are *Pithecia*, the sakis, or hooded monkeys; *Uacavia*, the woolly monkeys; *Chrysothrix* or golden monkeys; and *Nictipithecus*, the Dorocoulī monkeys.

The last and highest section of the monkeys (next to the anthropoid apes) is that of the Old World tribe *Cercopithecidæ*, if that family name is used, as is recently the custom, to cover all the formerly called «catarrhine» monkeys, distinguished by their obliquely-set nostrils, the nasal apertures being placed close together, and the nasal septum being narrow. Opposable thumbs and great toes exist in all, except the genus *Colobus*, the members of which want thumbs. The teeth are arranged to exhibit four incisors, two canines, four premolars and six molars in each jaw; the incisors are prominent, and the canines are especially large and strong — the latter teeth being separated by an interval or diastema from the upper outer incisor, and from the first lower premolar. The tail may be rudimentary or wanting, but in no case is it prehensile. Cheek-pouches, or pocket-like cavities excavated in the cheeks, which are used as receptacles for food preparatory to its mastication, are present in many; and the skin covering the prominences of the buttocks is frequently destitute of hair, becomes hardened and thus constitutes the so-called *natal callosities* of these animals. Sometimes these callosities exhibit brilliant colors, and the skin in the neighborhood of the nose, as in the mandrill, may also be striped with gay hues. In their distribution all the catarrhine monkeys inhabit Asia and Africa, a macaque inhabiting the Rock of Gibraltar, and called Barbary ape (q.v.).

Many of these monkeys are small or of moderate size, handsome and graceful. Such are the African guenons, green monkeys and mangabeys (qq.v.) of the genera *Cercopithecus* and *Cercocebus*. Nearly related to them are the macaques (q.v.); and the baboons (q.v.). These have cheek-pouches, and the fore limbs the longer. The genera without cheek-pouches and with the hind limbs longer than the fore limbs are the African thumbless genus *Colobus*, which contains the guerezas (q.v.); and the East Indian tribe *Semnopitheous* which contains the Hindu sacred monkey or entellus (q.v.), the proboscis monkey, negro monkey and several others described elsewhere under their names, some of which are large and extraordinary.

These Old World monkeys are more varied in their food and activities than are those of America, and are far superior to them in intelligence; consequently they furnish nearly all the pets, circus-performers and servants of wandering musicians that we see from time to time. Many of them breed in captivity, adapt themselves well to civilized life and betray a surprising ability to learn in various directions, though prone to be inattentive, and growing dull and surly in old age. Few, however, when taken into cold climates live long, even when most carefully treated, as they seem peculiarly susceptible to diseases of the lungs, which usually have a fatal termination.

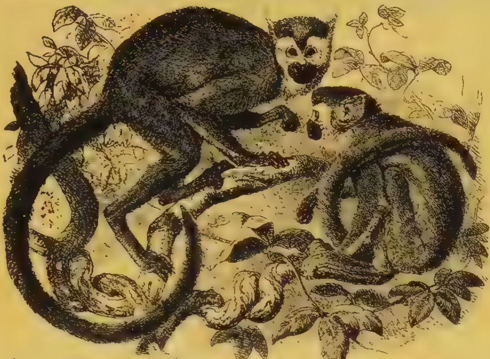
Excellent accounts of the monkeys of the world exist in the ‹Standard,› ‹Royal,› ‹Cassell's,› and ‹Allen's Natural Histories›; the last and most recent being a monograph by Forbes. Otherwise information must be gleaned mainly from the books of scientific travelers.

MONKHOUSE, William Cosmo, English author, poet and art critic; b. London, 18 March 1840; d. Skegness, Lincolnshire, England, 2 July 1901. He received his education at Saint Paul's School in London and in 1857 became a junior clerk in the Board of Trade office with which he was connected with advancement for the remainder of his life. Although not a great poet his work enjoys a high reputation among the works of the minor poets and as an art critic he won considerable attention. His work for the ‹Dictionary of National Biography› takes within its scope practically all of British art. He published ‹A Question of Honor,› novel (1868); ‹The Works of John Henry Foley› (1875); ‹The Italian Pre-Raphaelites› (1887); ‹British Contemporary Artists› (1899), etc. Among his poetical works are ‹A Dream of Idleness› (1865); ‹Corn and Poppies› (1890); ‹The Christ upon the Hill› (1895); and ‹Pasiteles the Elder,› published after his death.

MONKSHOOD. See ACONITE.

MONLUC, môṅ'lük', or **MONTLUC**, French marshal and military writer: b. Sainte Gemme, near Auch, 1502; d. Estillac, near Agen, July 1577. He entered the army as an archer, fought (1525) at Pavia, accompanied the campaign of Francis I against Charles V and aided much in the outcome by improvements in tactics and in the artillery and engineering. His defense of Siena (1555) was brilliant, but he became hated, as governor of Guienne, for his severity against the Protestants. He was first to recommend the introduction of caring for the wounded and the testing of officers. His ‹Memoirs,› which takes in from 1521 to 1574

AMERICAN MONKEYS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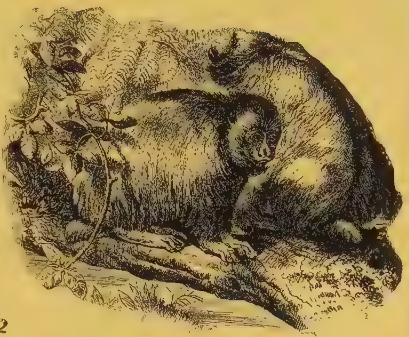
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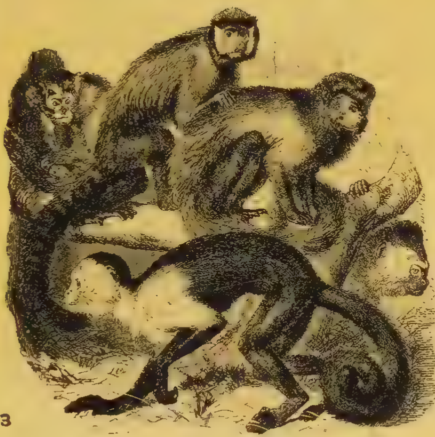
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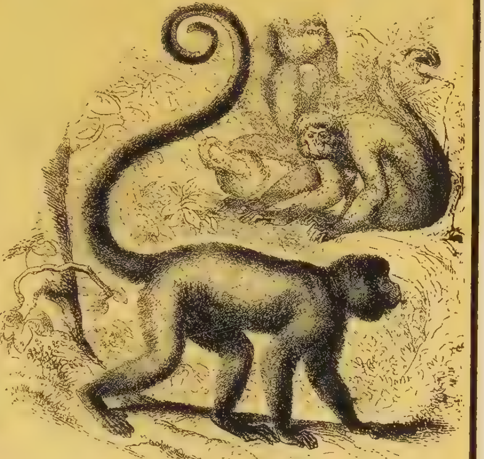
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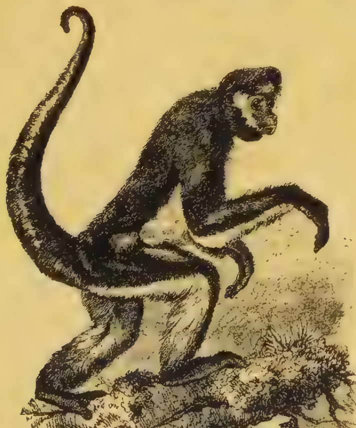
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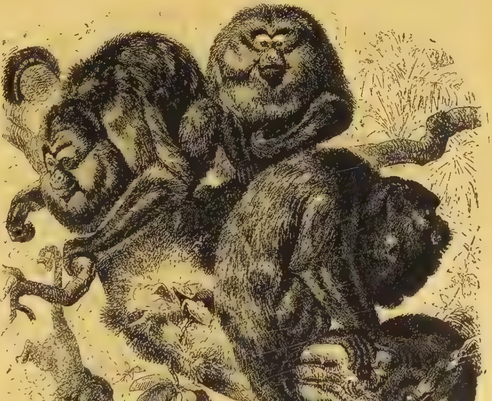
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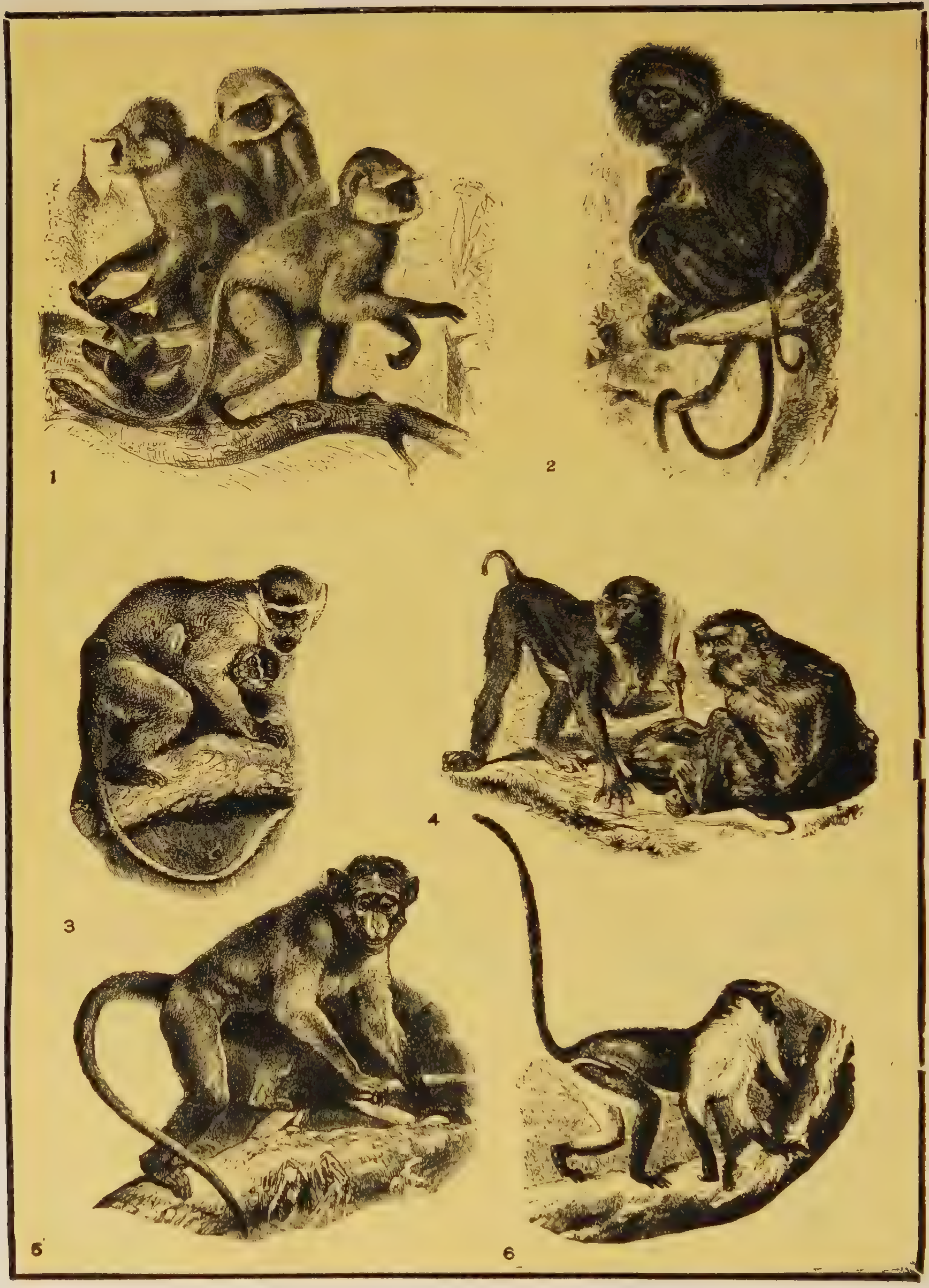
1 Titi or Death's Head Monkey (Chrysothrix sciureus)
2 Uakari Monkey (Uacaria calva)
3 A Group of Capuchins or Sapajous (Cebus)
4 Barrigudo (Lagothrix humboldti)
5 Spider Monkey (Ateles bartletti)
6 Black Couxios (Pithecia satanus)

OLD WORLD MONKEYS



1 Hanuman Monkey (Semnopithecus entellus)
2 Negro Monkey (Semnopithecus maurus)
3 Green Monkey (Cercopithecus callitrichus)
4 Pig-tailed Monkey (Macacus leoninus)
5 Bonnet Macaque (Macacus cynomolgus)
6 Diana Monkey (Cercopithecus diana)

and Henry IV, and called the ‘Soldier's Bible,’ has considerable value in the history of warfare. The best issue is by A. de Ruble (5 vols., Paris 1865–72); ‘Les Guerres d'Italie’ (ib. 1886, was edited by Baudrillart. Consult Rüstow, ‘Military Biographies’ (Zürich 1858); Norman, ‘Les mémorialistes, Monluc’ (Paris 1892); Courteault, Paul, ‘Blaise de Monluc, historien’ (ib. 1908), contains a bibliography.

MONMOUTH, mŏn'mŭth, **James,** Duke of, royal pretender and claimant to the English throne: b. Rotterdam, 9 April 1649; d. London, 25 July 1685. He was the natural son of Charles II and of Lucy Walters, as seems certain from the king's open recognition of him, although he so closely resembled Robert Sidney, whose mistress his mother had been, that Sidney has been supposed his father. Placed under the guardianship of Lord Crofts, he assumed the name of James Crofts and was brought up in France under the care of Henrietta Maria, the queen-dowager; was recognized and summoned to England by his father after the Restoration: was married to Anne Scott, heiress of Buccleuch and made Duke of Monmouth; and served in Holland in 1673. His Protestant sympathies, his clemency to the Scottish Covenanters whom he defeated at Bothwell Bridge (1679), and a story persistently circulated (and denied before Privy Council by the king) that Charles had secretly married his mother in Holland, made him popular with the Protestant party; and Shaftesbury repeatedly urged the king to legitimatize him and ensure a peaceable Protestant succession. He did his best to exclude James from the throne. After the Rye House Plot he escaped to Holland. Thence after the accession of James II he invaded England, possibly with the complicity of William of Orange, called the people to arms, raised a large force of Protestants, was proclaimed king at Taunton, but was defeated by Faversham at Sedgemoor. Taken prisoner he begged for his life from the king to no purpose, and was executed at the age of 36. He was handsome, weak, fickle and in his claims to the throne no doubt entirely under the control of political plotters. The ‘Diaries’ of Evelyn and Pepys give the setting of Monmouth's career; his rising is sketched with some historical verisimilitude in Doyle's ‘Micah Clarke’ (1888), a romance. Consult also Roberts, ‘Life of Monmouth’ (1844) and Fea, A., ‘King of Monmouth’ (New York 1902); the latter work outlines the popular legend that Monmouth was not executed, a substitute having taken his place, and tells how the country people long expected his return.

MONMOUTH, Ill., city, county-seat of Warren County, on the Chicago, Burlington and Quincy and the Iowa Central railroads, about 95 miles north by west of Springfield. It is in an agricultural region, and nearby are coal fields and valuable clay deposits. It was settled in 1836, and in 1852 was incorporated, receiving a new charter in 1874. The chief manufactures are pottery, sewer pipe, stoneware, boxes, agricultural implements, stump-pullers, soap, flour and dairy products. The trade is principally in coal, grain, flour, poultry, dairy products and livestock. Monmouth College, founded in 1856 under the auspices of the United Presbyterian Church, is here, also the Warren County Library. The chief city officers are the mayor, who holds office two years, and the council. The waterworks are owned and operated by the municipality. Pop. (1920) 8,116.

MONMOUTH, Battle of, in American history, a celebrated engagement between the American and British forces, the former commanded by General Washington and the latter by Sir Henry Clinton, which took place at Freehold, Monmouth County, N. J., 28 June 1778. On 18 June Sir Henry Clinton, acting under peremptory orders from the British Ministry, evacuated Philadelphia, which had been occupied by his army since the preceding September, and proceeded across New Jersey toward Brunswick, with a view of embarking on the Raritan. On hearing of this movement, Washington broke up his camp at Valley Forge, and having sent forward some light troops to harass the enemy started in pursuit. Owing to excessive heat the march of both armies was slow. At Allentown, Clinton turned to the right by a road leading through Freehold to Sandy Hook, to embark at the latter place; and Washington, who had hitherto been deterred by the advice of his officers, and particularly of Gen. Charles Lee, from attacking the enemy, determined at once to give him battle. The evening of the 27th found the main body of the enemy encamped on high ground near Monmouth courthouse, while the American advance, about 4,000 strong, under Lee, was posted at Englishtown, five miles distant, with the main body about three miles in the rear. The command of the advance had originally been given to Lafayette, with the consent of Lee; but the latter subsequently applied for and obtained it. Early on the 28th Lee engaged the rear division of the enemy, his orders being to hold it in check until the main body under Washington could come up. The Americans were at first successful, but owing to causes which have never been satisfactorily explained, the whole body soon after fell into a confusion and commenced a disorderly retreat, closely followed by the British. Washington, who was advancing hastily with the main body, received the first intimation of this movement in the crowds of fugitives who poured along the road. Exasperated at the failure of Lee to execute his orders he rode up to that general and reprimanded him. Then he reformed them, and hastened back to bring up the main body. Lee, resuming his command, held his position with spirit until compelled to retire and brought off his troops in good order. The main body, which had meanwhile taken a favorable position on an eminence, with a morass in front and a wood in the rear, opened an effective cannonade upon the British. The latter, after an ineffectual attempt to turn the American left under Lord Stirling, directed their chief efforts against the right commanded by Greene, where Wayne, under cover of an orchard, was harassing their centre by a severe fire. To dislodge him Colonel Moncton advanced with a column of royal grenadiers, but fell at the head of his troops, who were repulsed with considerable loss. The enemy at length fell back to the ground occupied by Lee in the morning, whither Washington was preparing to follow them when the approach of night and the exhaustion of his men induced him to defer the execution of his plan until the morning. During the night Clinton effected a noiseless retreat, and at daybreak was many miles away from the scene of battle. The excessive heat of the weather and the fatigued condition of the troops rendered a pursuit impracticable, and the royal army was suffered to proceed unmolested to the place of embarkation. The American loss in this engagement was 69 killed and 160 wounded; the British 300 killed and 100 prisoners including wounded. Their total loss by desertions and the casualties of battle during their march through New Jersey has been estimated at 2,000. For his conduct in this battle Lee was court-martialed and suspended for one year from his command. Consult Carrington, H. B., 'Battles of the American Revolution' (New York 1876); Dawson, H. B., 'Battles of the United States' (New York 1858); 'Lee, C., Trial of, 4 July 1778' (New York 1864).

MONMOUTH COLLEGE, in Monmouth, Ill., a coeducational institution, under the auspices of the United Presbyterians. It was founded in 1856, and in 1915 there were connected with the school 26 professors and instructors and 451 students. There were about 12,000 volumes in the library; the grounds and buildings were valued at $340,000; the productive funds amounted to $284,000; and the annual income was about $49,000. The departments are the preparatory, music and art and graduate. The college courses consist of nine groups which lead to the degrees of B.A. and B.S.

MONNA LISA, or 'La Gioconda,' the famous masterpiece of Leonardo da Vinci, disappeared from the Louvre in Paris 21 or 22 Aug. 1911. The picture had been taken out of the frame, which was found on a back staircase of the building. For over two years the mystery remained unsolved. On 12 Dec. 1913 it was announced that the painting had been recovered in Florence and returned to Paris. It had been stolen from the Louvre by an Italian workman named Vincenzo Perugia, who gave as his reason for the theft that he wished to retaliate on France for taking so many Italian masterpieces from Italy. On 5 June 1914 Perugia was sentenced to one year and 15 days' imprisonment with payment of costs.

MONNA VANNA. In 1902 Maurice Maeterlinck, who for a dozen years had been composing tenuous dramas of the imagination, expressive of vague fears, and symbolic of the coming of death, turned in 'Monna Vanna' to a more usual type of play. In place of an airy plot but half suggested, he developed a close-knit story; in place of shadowy figures uttering childlike phrases and implying as much by their silence as by their talk, he presented living figures engaged in rhetorical debate; and in place of the merest impressionism of mood, he displayed a sudden practical interest in problems of conduct. Two such problems, in particular, he considered: first, as to whether a woman might ever honorably sell her honor; and, second, as to whether her husband's disbelief in the purity of her motives might ever justify her leaving him for one who could understand her. Monna Vanna, in order to save the lives of 30,000 starving Pisans, besieged by the Florentines, consents to yield her honor to the commander of the enemy. But the latter, her boyhood lover, refuses to profit from the advantage he has taken of her, and, assailed by the state he serves, returns with her to Pisa as her guest. Her husband, who has raged against her decision to go to Prinzivalle in the first place, refuses to believe that this warrior has spared her. She can rescue him from death only by falsely proclaiming his guilt and her own desire for vengeance, thus gaining possession of the keys to his dungeon, from which she will flee with him at the earliest opportunity. Thus Maeterlinck, like Shakespeare in 'Measure for Measure' and Phillips in 'Pietro of Siena,' though he raises the question of a woman's right to barter her honor for the life or lives of others, does not venture to exact of her the price. Such is his procedure, also, in two other plays, 'Joyzelle' and 'Marie-Magdeleine.' Neither of these has been so successful upon the stage as 'Monna Vanna,' which may be read in the English versions of A. I. du Pont Coleman (1903), Charlotte Porter (1904) and Alfred Sutro (1907). The piece is discussed in the monographs on Maeterlinck by Gerard Harry, M. J. Moses, Edward Thomas and Una Clark.

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MONO, mō'nō, a lake or «sink» in Mono County, Cal., on the eastern slope of the Sierra Nevada, in a gold and silver mining region, about 150 miles southeast of Sacramento. The lake is circular in form, nearly 15 miles across; area, about 200 square miles, contains almost as a central point, Mono Island. A short railroad passes along the eastern shore, chief village station, Monolake. A number of streams enter the lake, but it has no apparent outlet. The waters are alkaline and contain no fish. A species of insect deposit their ova on the surface of the waters, and sometimes so great are the numbers that they look like islands. The Digger Indians collect the insects and ova and prepare from them an edible delicacy. See Koo-cha-bee.

MONO, the common name in Guatemala for the Central American howling monkey (*Mycetes villosus*).

MONOCACY, mō-nŏk'ạ-sĭ, **Battle on the,** an engagement during the Civil War when on 4–5 July 1864, General Early with 20,000 Confederate troops, after driving the Union forces, under General Sigel, from the lower Shenandoah Valley, crossed the Potomac into Maryland north of Harper's Ferry, on his march to Washington, demonstrated on Sigel, who had retreated to Maryland Heights and, crossing South Mountain by Turner's and Crampton's Gaps, concentrated his main body on the night of the 8th near Middletown in the Catoctin Valley, his cavalry, after some sharp skirmishing during the day, being in advance, between Middletown and Frederick. Meanwhile Union forces had gathered to oppose his march. Gen. Lew Wallace, commanding the Middle Department, with headquarters at Baltimore, on the 6th collected a mixed force, numbering 2,700 men, under Gen. E. B. Tyler, at Monocacy Junction, near Frederick, and disposed it to cover the Baltimore and Ohio Railroad and its bridge, and the Baltimore pike with its stone-pier bridge. Cavalry was sent out on the road beyond Frederick, which ran into Bradley T. Johnson's cavalry, and fell back. On the 8th Wallace was joined by a part of Ricketts' division of the Sixth corps from the Army of the Potomac, which was advanced to Frederick, but during the night it was withdrawn and crossed to the east bank of the Monocacy, where meanwhile other parts of Ricketts' division had come up by rail from Baltimore. Ricketts' division of about 3,350 men was formed on Tyler's left, covering the Washington road and its wooden bridge. Both flanks and the fords were guarded by cavalry and skirmishers were deployed on the bank of the river. Wallace had but six field-guns; three were given to Tyler and three to Ricketts. An earthwork and two blockhouses commanded both the railroad bridge and the bridge on the Washington road. On the morning of the 9th Early advanced from Frederick to attack Wallace, Rodes' division on the left, along the Baltimore pike, and Ramseur's in the centre on the Washington road, while Gordon's division, following McCausland's cavalry, inclined to the right to reach the fords a mile below Wallace's left. Rodes and Ramseur drove the Union skirmishers to the bank of the river; Ramseur drove those in his front beyond it; and four heavy batteries of 16 guns crowning the heights near the river, at 9 A.M., opened fire upon the Union lines opposite. By noon the Confederate cavalry had forded the river, and dismounting, advanced on Ricketts' left, gaining a temporary advantage, but were soon driven back. Gordon then crossed his infantry and reinforced the cavalry. Ricketts, holding on the bridge with his right to check Ramseur, changed front to the left and engaged Gordon and the cavalry, sometimes yielding ground, and again regaining it, but the enfilading fire of the guns across the river, and the continued heavy pressure of Gordon on his front, right and left flanks, caused Wallace at 4 P.M. to withdraw him toward the Baltimore pike, having first burned the wooden bridge and the blockhouse at its farther end. Tyler had continued to hold his position against Rodes, in part west of the river, covering the stone bridge of the Baltimore pike, but Gordon's troops, following up the east side of the stream, on Ricketts' heels, struck the pike before the bridge-guard could get away, capturing several hundred prisoners, Tyler narrowly escaping. Wallace fell back by the Baltimore road in the direction of Ellicott's Mills, Early following but a short distance. Early buried his dead and sent over 400 of his severely wounded to the hospitals in Frederick. He levied and collected $200,000 from the citizens of Frederick, seized a good supply of shoes, bacon and flour, and on the morning of the 10th resumed his march on the direct road to Washington, halting at night within four miles of Rockville. The Union loss at Monocacy was 123 killed, 603 wounded and 568 missing, a total of 1,294, of whom 1,073 were of Ricketts' division. Early reports his loss as about 700 killed and wounded, but it must have been greater, as Gordon reports the loss in his division alone as 698. The great importance of the battle on the Monocacy lies in the fact that the day gained in delaying Early enabled the remainder of the Sixth corps to reach Washington from Grant's army, as well as a part of the Nineteenth corps from New Orleans, before Early could make an attack on the city. General Grant says: «Whether the delay caused by the battle amounted to a day or not, General Wallace contributed on this occasion, by the defeat of the troops under him, a greater benefit to the cause than often falls to the lot of a commander of an equal force to render by means of a victory.» Consult ‹Official Records› (Vol. XXXVII); Pond, ‹The Shenandoah Valley in 1864›; Grant's ‹Personal Memoirs› (Vol. II); Early, ‹Last Year of the War for Independence›; Haynes, E. M., ‹History of the Tenth Regiment, Vt.› (Vol. III, pp. 184–238, Rutland 1894); The Century Company's ‹Battles and Leaders of the Civil War› (Vol. IV).

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MONOCEROS, mō-nŏs'ėr-ŏs, or **UNICORN**, from the Greek *μόνος*, *monos* (single), and *κέρας*, *keras* (horn), a constellation in the astronomical chart lying between Canis major and Canis minor, south of Gemini and Cancer, and introduced (1624) by Bartsch. It is made up of multiple stars, clusters and nebulæ but has no star brighter than fourth magnitude.

MONOCHORD, a musical instrument with one string, invented by Pythagoras, and much employed by the ancients in the musical training of the voice and ear. The modified form of the instrument used in natural philosophy lecture-rooms is often called a sonometer; it consists of one or more strings stretched over a sounding-box. A string is fastened at one end of the box, and passes at the other end over a fixed pulley, which enables it to be stretched by means of weights; it passes over two fixed bridges near the ends of the box, and there is a movable bridge between to alter the length of the vibrating portion of the string. Strings are employed to produce musical sounds in the violin, harp, guitar, piano, etc. The sonometer is an indispensable piece of apparatus to lecturers on acoustics not only for the proof of the law of vibrating strings, but also to illustrate the relations of harmonics and the fundamental ideas of undulations.

MONOCHROMATIC LIGHT, *in physics*, a light which consists of a single color which is so pure and so definite that when it is examined by the spectroscope it gives but a single bright line. An approximately monochromatic light may easily be obtained by volatilizing salt, or some other sodium compound, in the flame of a Bunsen burner. An orange-yellow color, of great purity, results. Viewed by this light, everything white or yellow looks bright, while vermilion, ultramarine and other colors that do not contain any sensible proportion of yellow appear black. Monochromatic light is greatly used in physics, for the study of certain kinds of phenomena in optics.

MONOCHROME (Greek, *monos*, single, and *chroma*, color), in ancient art, a painting executed in a single color. The word is generally applied to painting in the various shades of the same color. The first specimens of the art of painting were of one tint only, which was most commonly red, made either with cinnabar or minium. Instead of red, white paint was sometimes used. The first four plates in the first volume of the paintings of Herculaneum contain several monochromes upon marble. The most numerous monuments existing of this kind of painting are on terra cotta.

MONOCLINE. See FOLDS.

MONOCOTYLEDONS, plants of that great division of angiospermous plants whose embryos sprout in only one seed-leaf or cotyledon, which springs from one side of the axis of the growth; the opposite of Dicotyledons (q.v.). In one system of botany the term was employed as a synonym of *Endogens,* but this use is obsolete.

MONOD, mō'nō, **Adolphe,** French Protestant theologian: b. Copenhagen, 1802; d. Paris, 6 April 1856. He studied at Geneva, was minister at Naples (1825–27), where he founded an Evangelical congregation; then at Lyons (1828–31). From 1836 he was a professor at Montauban, and from 1844 he was minister of the Reform Church. He wrote 'Sermons' (Paris 1860; 3d ed., 4 vols.); 'La Femme' (Paris, 11th ed., 1894); 'Les adieux à mes amis et à l'Église' (1856; 12th ed., 1894). Consult Monod, S., 'Life and Letters of A. Monod' (London 1885); Stapfer, 'La grande prédication chrétienne en France. Bossuet, Adolphe Monod' (Paris 1898).

MONOD, Frédéric, French Protestant clergyman: b. Monnaz, Switzerland, 17 May 1794; d. Paris, 30 Dec. 1863. He was educated at Geneva, but came under the influence of Robert Haldane and was ordained in 1818. He then went to Paris in service of the Bible Society, then assisted (1820) his father, a pastor at Paris, becoming (1832) titular pastor of the Oratoire. As editor of the *Archives du christianisme au dix-neuvième siècle* for 43 years, he became prominent (1848) when religion was menaced by the revolution. He favored the separation of Church and State and a Reformed Church creed; he, opening the synod, in September, found his motion for formulation of a creed lost. Thereupon he decided on establishing a free church on orthodox basis in spite of the persuasion of his brother Adolphe (q.v.), the synod and the Paris Consistory. Resigning from his Oratoire pastorate (1849) he opened a small chapel and founded the Église Libre. He was successful in uniting the Protestant congregations who had left the State Church, and established a constitution the first clause of which stated: "We believe that the entire Scripture of the Old and New Testament is inspired by God, and thus constitutes the sole and infallible rule of faith and life." At the Third Biennial Synod (1852) evangelization commenced and 22 posts exist at present besides affiliations, but the number of congregations (73 in 1873) has fallen off to 36 recently, many returning to the Reformed Church. Consult Monod, G., 'La Famille Monod' (Paris 1890); Pédezert, J., 'Cinquante ans de souvenirs religieux' (Paris 1896).

MONODELPHIA, a name formerly applied to all mammals esteemed higher than marsupials (*Didelphia*) considered as a group distinguished primarily by the fact that the uterus or womb is single and shows a single uterine cavity. It has been shown that this distinction does not hold and the term has consequently become obsolete.

MONODY, from the Greek monodia, a solo in contradistinction to the polyphony, the song of several or many voices. The term has been brought down to modern times as conveying a sense of melancholy or sadness in its diction. Thus in literature a monody is a composition dwelling on some single emotional subject. In poetry the monody of the Greeks was a lyric solo in tragedy, an ode voiced by an actor on a painful motive, hence, when of a funeral or dirge character, it closely approaches *threnody.* In music monody is a song for a single voice with musical accompaniment; monodies have been introduced into opera, Peri's 'Dafne' (1597) being probably the first occasion, and they have found a regular place in the growth of operatic composition as well as in oratorios. The term is also used recently as synonymous with monotony as "the monody of the waves," etc.

MONŒCIUS INFLORESCENCE. See DIŒCIOUS FLOWER.

MONOGRAM (*monos,* single or only, and *gramma,* meaning "a single mark"), a character or cipher composed of one, two or more letters interwoven, being a sort of abbreviation of a name, used as a seal or badge, in coats of arms, etc. Monograms were much used on coins by the Greeks and the Romans. They were also used on standards, walls and tapestry, seals and documents, in which they were employed not only by princes and ecclesiastical dignitaries, but also by magistrates and notaries. At the commencement of the Christian period their use was universal. The titles and rubrics of Greek manuscripts are frequently monogrammatic, and numerous and diversified monograms are found in Latin manuscripts. Alphabets like the Roman, of an angular character, have many letters with corresponding parts; and the upright strokes, the horizontal lines and the curves are easily made by arranging them so that similar portions shall coincide, to produce numerous combinations. Monograms are generally combinations of more than two letters; when only two were incorporated they were generally designated ligatures. After the 12th century they gradually went out of use. The use of them remained longest in Germany, where it was formally abolished by the Diet of Worms in 1495. The knowledge of monograms of this public kind is of great importance for the illustration of the monuments and documents of the Middle Ages, and therefore forms a particular branch of diplomatics; for they were much employed in the mediæval diplomatic art. The term was subsequently applied to all sorts of ciphers and signs, with which artists, particularly painters and engravers, were accustomed to designate their works. The mediæval seal-engraver, to economize as much as possible the annular space available for the legend, favored both ligatures and monograms. Many of those seals had the initials of their owners blended and incorporated with the devices, called merchant-marks, corresponding somewhat to the modern trade-marks, which were the stamp, as it were, by which the work of each artist was known. Many of the modern monograms are copied from mediæval examples. Consult Brulliot, 'Dictionnaire des Monogrammes' (1832–34); Duplesssis and Bouchot, 'Dictionnaire des Marques et Monogrammes de Graveurs' (1886–87); Bouvenne, 'Les Monogrammes Historiques' (1870); Fagan, 'Collectors' Marks' (1883).

MONOLITHS. See STONES, STANDING.

MONOMANIA, from the Greek *μόνος*, *monos* (single), and *μανια*, *mania* (madness). That form of mental derangement which distinguishes itself by an abnormal conception or action on one subject only, leaving the mind sane on all other points. The eccentricity of delusion does not extend to any other subject or act. The term *craze* is often used to cover mild forms of monomania.

MONOMETALLISM, the principle of having only one metallic standard in the coinage of a country, opposed to bimetallism. See BIMETALLISM; COINAGE; CURRENCY.

MONONA, mō-nō'nạ, a lake in Wisconsin, one of a group of lakes near Madison in Dane County. See FOUR LAKES.

MONONGAHELA, mō-nŏn-gạ-hē'lạ, a river which has its rise in the northwestern part of West Virginia, and flows north into Pennsylvania, where it unites at Pittsburgh with the Allegheny to form the Ohio River. The headwaters of the Monongahela are in the Alleghany Mountains near the headwaters of the Potomac. The two head-streams of the Monongahela unite near Fairmont in Marion County, W. Va., and from the point of junction on the north become a swiftly flowing stream, furnishing water power for several manufacturing towns and cities. The whole course is very irregular; the length is about 300 miles. It was made navigable about 106 miles from its mouth to Morgantown, in Monongahela County, W. Va., by a system of locks, nine in number, and other locks above Morgantown now make the river navigable as far as Fairmont. The largest tributary is the Youghiogheny, a navigable river, which has its source in the mountains in the southwestern part of Garrett County, Md., and enters the Monongahela near Pittsburgh. The Cheat River, the next largest tributary, is a stream in the northeastern part of West Virginia. It joins the Monongahela in Pennsylvania, a few miles north of the border. The river flows through a country which has fertile farm lands in the valley and the whole section is rich in coal. Near Pittsburgh, then Fort Duquesne, on the banks of the river, on 9 July 1755, the French and Indians won a victory over Braddock's Anglo-American troops.

MONONGAHELA CITY, Pa., city, in Washington County, on the Monongahela River, and on the Pennsylvania, and the Pittsburgh and Lake Erie railroads, about 32 miles south of Pittsburgh. It is in a coal region, in which the chief industries are coal mining and manufacturing. It was settled in 1792 by Joseph Parkison, was incorporated as a borough 3 April 1833 and chartered as a city 24 March 1873. It has large industrial establishments, employing about 6,000 persons, or about 600 more than the whole population as given by the federal census of 1900. The chief manufactures are glass, foundry and machine-shop products, flour, lumber, chemicals and paper. It has considerable trade in the home manufactures and in coal and farm products. The principal buildings are 15 churches, six public schools, an academy, government building, memorial hospital and municipal building. The four banks contain a combined capital of $2,500,000. The government is administered under a third-class city rule. The government provides for a mayor, comptroller and a board of commissioners, four in number, the mayor being president of the board. All are elected every four years. The majority of the inhabitants are American born, but there are quite a number of Italians and Slavs. Pop. (1920) 8,688.

MONOPHYSITES (from Greek *monos*, single, and *physis*, nature), those followers of the opinion in the early Church which ascribes but one nature to Christ in contradistinction to the orthodox doctrine that he was both divine and human, true God and true man. The Monophysites were mainly confined to the Eastern Church and obtained no footing in the West. The edict called Henoticon, issued by the Emperor Zeno in 482, was not able to quiet the long and often bloody contests incident to this controversy, and the orthodox Church, by its sentences of excommunication, occasioned a formal secession on the part of the Monophysites. This separation took place in the first half of the 6th century. Nor did they remain united among themselves. In 519 controversies arose among them respecting the question whether the body of Christ is corruptible or not. About 560, a Monophysite, Askusnages, and after him Philoponus, a noted Alexandrian philosopher of that century, conceived the idea of styling the three persons of the Deity three Gods. These Tritheists and their adherents, even in the eyes of the Monophysites, were heretics, and were the occasion of many Monophysites turning Catholics. In Egypt, Syria and Mesopotamia the Monophysite congregations, however, remained the strongest, had patriarchs at Alexandria and Antioch, existing, without interruption, by the side of the imperial orthodox patriarchs; and after the Syrian, Jacob Baradæus had, about 570, established their religious constitution, formed the independent churches of the Jacobites and Armenians, which separated from the Greeks as well as the Romans, and have for that reason been able to maintain themselves since the 7th century, even under the dominion of the Mohammedans. Excepting their doctrine of one nature in Christ they coincide, in the main points of belief, with the Greek Church; their worship also resembles the Greek rather than the Roman, but has, from their national character and their superstition, received variations, which are most striking in the religious constitution of the Egyptian Jacobites (q.v.). See JACOBITES; *Armenian Church* under ARMENIA.

MONOPLEGIA, mŏn-ō-plē'jĭ-ạ, a paralysis limited to one organ or part, e.g., one arm or one leg. If both arms or legs are stricken the condition is called paraplegia; while if arm and leg and other organs on one side are affected it is called hemiplegia. It is caused by circumscribed lesions of the nervous system, in brain, spinal cord or nerves. An example of monoplegia is Bell's palsy (q.v.). See BRAIN, DISEASES OF.

MONOPOLI, mō-nŏp'ō-lē, Italy, town, in the province of Bari, on the Adriatic Sea and on the Bari-Brindisi Railway. It is the site of the ancient Minopolis and the present seat of a bishopric. Its old castle and remains of the encircling wall and its prehistoric graves lend it considerable archæological interest. It has a 12th century cathedral, a gymnasium, technical school, open harbor, and its industrial activity extends to oil-pressing, soap-making and trading in oil and wines. In 1911 it had a population of 24,104.

MONOPOLY (Greek, *monopolia*, single or sole selling) is an exclusive right, secured to one or more persons, to carry on some branch of trade or manufacture, in contradistinction to a freedom of trade or manufacture enjoyed by all the world. The most frequent monopolies formerly granted were the right of trading to certain foreign countries, the right of importing or exporting certain articles, and that of exercising particular arts or trades. Such exclusive rights were very common in Great Britain previous to the accession of the house of Stuart, and were carried to an oppressive and injurious extent during the reign of Queen Elizabeth. The grievance at length became so insupportable that, notwithstanding the opposition of government, which looked upon the power of granting monopolies as a very valuable part of the prerogative, they were abolished by an act of 1623. However, various companies for the exploitation of the colonies and possessions of Great Britain, such as the Hudson Bay and East India companies (qq.v.), of an essentially monopolistic nature, continued to exist until well on in the last century. Nevertheless this act secured the freedom of industry in Great Britain, and has done more perhaps to excite a spirit of invention and industry and to accelerate the progress of wealth than any other in the statute book. Government monopolies, however, are common on the Continent, and constitute one of the chief means of obtaining revenue. There is one species of monopoly sanctioned by the laws of all countries that have made any advances in the arts, namely, the exclusive right of an invention or improvement for a limited number of years. It is, in fact, a kind of property created by law for the benefit of the inventor, and which he could not effectually acquire or secure without the aid of the law. The exclusive right of an author to the publication of his own work is hardly a monopoly, but rather a right of property, resting upon the same principle as the right to lands or chattels. The law, therefore, by giving an author the exclusive right to the publication of his own work for a limited number of years makes no grant; it is only allowing him what is his own for a limited time. But the exclusive right to the use of an invention or improvement is a monopoly, since it deprives others, for that period, of the chance of the advantage of making the same improvement, discovery or invention themselves. Capitalists, either single or combined, may produce commodities so much better and cheaper than others can do as practically to command the entire sale, and are in popular language called monopolists. But having no legal rights or advantages that are not open to all, they are not in the legal sense in possession of a monopoly. In the oldest sense of the term they are monopolists; but since the term is now used in an unfavorable sense, its discontinuance as applicable to these is only just. It may be assumed as an economical axiom that every interference with absolute freedom in acts of exchange can be defended only on the highest grounds of public policy. Any advantage given to a particular interest is not only a wrong to the general public, but will in time bring a just retribution to the favored class.

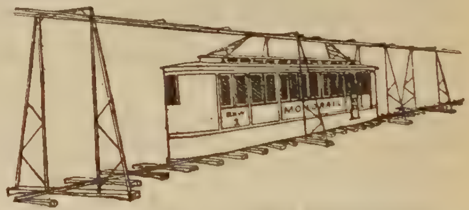
In the United States the only monopolies that the laws and the individual states look on with favor consist of the post office, which is a government monopoly, and the rights granted to individuals under the patent and copyright laws. Monopolies commonly known as trusts are looked on with odium, and various States have enacted laws making a trust an illegal combination of individuals. See TRUSTS; COPYRIGHT; PATENT.

Bibliography.— Ely, R. T., ‹Monopolies and Trusts› (New York 1900); Levy, H., ‹Monopoly and Competition› (New York 1911); Schäffle, ‹Theorie der ausschliessenden absatzverhältnisse› (Tübingen 1867).

MONORAIL, a single-rail type of railway designed for economy of construction, increased speed and for mountainous regions. The first idea of a single-rail railway dates back to 100 years ago, and many such are now being used in various parts of the world.

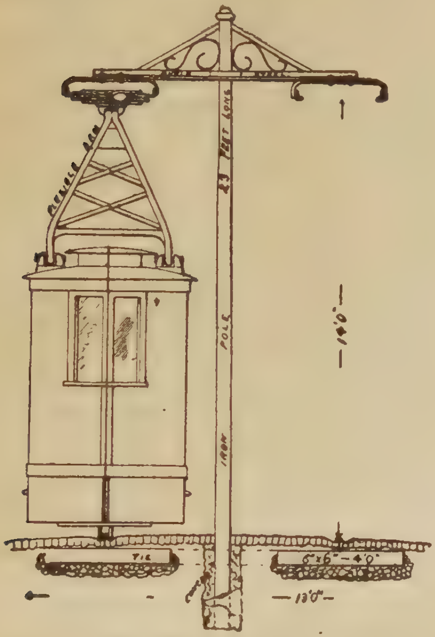
The first car run on a single rail, the invention of M. Charles Lartigue, has been in practical operation for many years in Djiboniti, a French-African post. The car is kept vertical by its attachment to a laterally placed horse, which balances the car as a hansom is balanced by attaching the horse in front. The development of this primitive idea attracted the genius of all great civilized countries, and aided by government patronage, individual effort and fortunes, made great progress.

An early type of monorail was one where all the different resistances to a swiftly moving car or train, except the atmospheric resistance, was concentrated in the vertical plane of the centre of gravity of the car or train, being partially concentrated by centrifugal force, and those resistances which were not concentrated at the centre are nearly compensated for by friction removing devices. When the said body is at rest, or slowly moving, the unbalanced forces, only, are mechanically concentrated with a minimum friction, and the stability is positively and absolutely preserved without jarring movement. The downward vertical force consists of the weight of cars, trucks and load. This weight is delivered to, and directly sustained by, two centrally disposed bearing rails laid with precision as to alignment and surface, and closely gauged to each other, so as to constitute practically a single support, while the vertical integrity or stability of the weight thus delivered to a central point is conserved when necessary by upward forces acting through the medium of dependent tension members, fitted with frictionless wheels bearing against inverted girders or rails; when moving at speed,



The Tunis Monorail.

stability is almost entirely preserved naturally and automatically, and only slight strain is on the dependent tension members. The magnitude of the downward forces is a matter simply of weight of cars; the upward forces are a matter of mechanical moments or leverages; the upward forces may amount to 10 per cent of the downward forces for usual cases. The downward force is delivered through the medium of the main central wheel, bearing on the two central rails as on a single rail. The side clutch wheels, that bear against the inverted girders or rails, guide, clutch and secure the car truck to its normal plane or path, forcing the truck to follow precisely any assigned inclination; for example, around curves. The central bearing rails and the inverted side clutch rails being laid with precision as to line, grade and inclination, the lateral and top-heavy swaying and recurrent oscillation now observable in locomotives in motion can never obtain; nor can the truck derail, as it is clutched to the track.

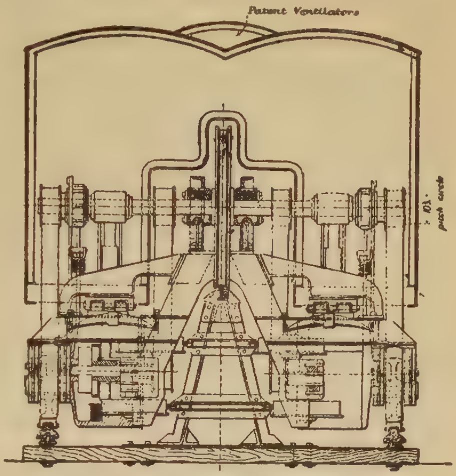


For surface street construction, showing overhead truck at the maximum height of 14 feet.

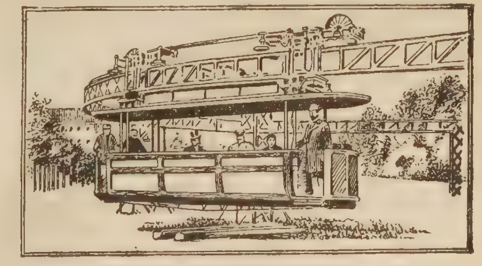
The propulsion of cars is effected by electric motors, two or four motors to each truck, the number of motors being dependent upon the starting pull, acceleration and speed required.

William B. Mack's design, shown here, appears to have been awarded more consideration among engineers than any of the many similar plans patented. As far back as 1872 a charter was granted in the State of New York for the building of a hanging railroad which had the general mechanical principles of the hanging roads more recently exploited in Germany, France and Russia, but the Cook system, shown here, appeared to be the only serious effort made to date at hanging cars on the side of the structure in place of underneath.

E. Moody Boynton patented plans for a monorailway which were approved by such experienced railroad men as Austin Corbin. Several short test roads were built and operated. The Tunis plan, here illustrated, is a modification of Boynton's. As will be seen, the single rail is laid on the ground like the rails of steam roads and trolley lines. Over the single rail at fixed intervals are trusses, or bents, joined by cross pieces at the top and supporting the guides which prevent the car from toppling over. The car itself also embodies some unique and interesting features. It is narrower than the standard trolley or railroad car and rests on a single pair of wheels, or, in the full-size coach, on two trucks of two wheels each, arranged tandem, just under the centre of the floor, the platform and superstructure being balanced on them. The car is balanced on the single rail, the wheels being of the grooved pattern. So accurately are the weights adjusted that a slight lurch of the body will sway the car from side to side. At first some apprehension was expressed that in going around curves the centrifugal motion of the car would impose too great a strain on the bents, but this fear has proved wholly groundless. By allowing for the centrifugal force by the slant toward the inner side of the circle which is accomplished on ordinary roads by raising the other rail the weight is thrown off the bents and approximately equalized.



Behr System.



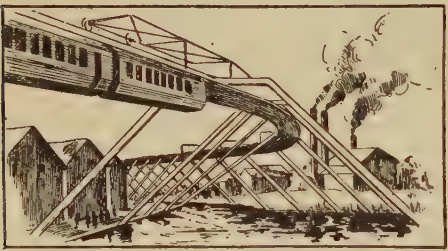
Romanoff System

The English monorail known as the Behr System, here illustrated, has been in operation for a number of years at Ballybunnion, Ireland,

and was successfully tested by the Belgian government, securing a speed of 83 miles per hour with a car weighing 70 tons. In 1901 and 1902 the English Parliament granted Mr. Behr's company the right to construct a road between Manchester and Liverpool, after the plans had been examined and approved by many eminent engineers.

The track is a single rail of the same shape and weight as generally used on steam roads. This rail is fastened at the top of an A-shaped structure made of steel. The structure is riveted to steel ties firmly imbedded in cement and rock ballast. The triangular supports for the rail are only four feet high, and one is placed every three feet three inches. At each side and 18 inches from the ground is placed a light guide rail to keep the moving car in position. The entire weight of the car rests upon large grooved wheels which travel upon the large rail at the top of the framework. As electric motors are used to propel the train, each of these wheels is a «driver.» Current is conducted on rails placed upon the ties, but insulated from them.

The car consists of two compartments, one on each side of the structure, and are 60 feet long, weighing four tons each.



Suspension Railway, Barmen, Germany.

The monorail idea has been exploited in Germany, France and Russia in its application to hanging cars, but Germany alone has secured results. A suspended overhead railway system of rapid transit is now in operation between the three manufacturing towns of Vohwinkel, Eberfeld and Barmen, near Cologne, Germany. The road is built on a system of latticed longitudinal girders, one vertical and two horizontal, assembled into the form of an I-section. The main girders form the web of the I, and the lateral girders, which give the requisite lateral stiffness, serve as the top and bottom flanges of the I. Diagonal tie-rods extend from the upper panel points of the central girder to a connection with the chords of the bottom lateral girder. The last mentioned chords consist of steel I-beams, and upon their upper flanges is laid the single T-rail, from which the cars depend and on which they run. The girders, which vary in span from 21 to 33 metres (68.88 feet to 108.24 feet), are carried upon supports varying in structure with the locality where they are used. Where the railway is carried immediately above the Wupper River the A-frame style of pier is used, while in the towns through which the line passes the trusses are carried upon substantial U-frames. The A-frame consists of two rectangular latticed struts, which are united at the top by a rectangular plate yoke.

The cars are 37.7 feet long, 8.5 feet high and 6.88 feet wide; are therefore fairly long and narrow, and are slightly tapered at the ends.

They have a seating capacity of 50, and are built with two side doors opening inwardly, and two auxiliary doors at the ends. The total weight of each car is 12 tons. The cars are freely suspended from two trucks spaced eight metres apart and having a diameter of 0.9 metres. The wheels are mounted in tandem to run on a single rail and are driven by two electric motors of 36 horse power each, through the medium of transmission gearing. The motor trucks receive current by means of a slipshoe and a contact rail, which is carried on the bottom of the lateral girder, somewhat to the inside of the main supporting beam.

The truck-frames embrace the rail-girders and the rails so closely that a play of seven millimetres is allowed and that derailment is impossible. If a wheel or axle should break the cars would be held up by the frames.

Oscillation of the car is limited by two projections on the lower part of the hook-shaped frame. The cars swing around the curve in a slightly inclined position and spontaneously reassume their normal vertical position when a straight part of the rail is reached. To the passengers the change in equilibrium is imperceptible. Since a sudden change in equilibrium causes an oscillation proportionate to the velocity and the angle determined by the radius of the curve, which oscillation lies within twice the value of this angle, comparatively long transitional bends have been provided by reason of which the equilibrium is gradually changed, with the result that almost inappreciable oscillations are produced.

A Russian electric engineer named Hippolyte Romanoff has invented a monorailway of some merit. The invention consists of a monorail hanging car as shown here. The rails are supported by T-shaped columns, the carriages being suspended in the air and propelled by wheels running along the rails. These wheels are without flanges, which Romanoff asserts retard speed by clinging to the rails while rounding curves, but are prevented from leaving the rails by means of smaller wheels which grip the rails horizontally.

An electric feed-wire runs parallel with the rail. The cars have three supports each. If the first is broken the second comes into play automatically, and then the third. Should any one of the cars be stopped by an accident or for any reason other than the natural one of pausing at a station, all the cars behind would stop also, thus preventing any rear-end collisions.

In May 1907, with a gyroscope monorail car Mr. Louis Brennan, C. B., the inventor of the Brennan torpedo used by the British government, demonstrated before the Royal Society of Great Britain that he had discovered a practical application of the gyroscope.

The invention is, briefly, a system by which a vehicle or a train of vehicles supported by a single row of wheels may travel on a single rail and maintain perfect equilibrium in motion regardless of the distribution of the load, wind pressure, etc. Automatic stability mechanism carried by the vehicle itself endows it with this power. The mechanism consists essentially of two flywheels rotated directly by electric motors in opposite directions at a very high velocity and mounted so that their action can be utilized. These flywheels are mounted on high-class bearings and are placed in exhausted cases, so that both air and journal friction is reduced to a minimum, and consequently the power required to keep them in rapid motion is very small. The stored up energy in the flywheels when revolving at full speed is so great and the friction so small that if the driving current is cut off altogether they will run at sufficient velocity to impart stability to the vehicle for several hours, while it will take from two to three days before they come to rest. The model car, while running on a curved monorail leans and so automatically balances the effect of centrifugal force, while a single wire hawser stretched across a river or ravine is all that is necessary in the shape of a bridge.

In 1909 Froelich, a German, developed another type of gyroscopic car with a so-called «precession motor,» which did not pass beyond the experimental stage, and about two years later the Schilowsky system was brought out in which the gyroscopic principle is also employed. Consult *Journal of the Franklin Institute* (Vols. CLXIX and CLXXIV) and files of the *Scientific American,* the *Engineer* and *Engineering* (London).

MONOTHEISM (Greek μόνος single θεός god), *in religion,* the belief that God is one or that there is only one God. Several religious beliefs are in opposition to this tenet: polytheism, which holds that there are many gods; atheism, which denies the existence of God altogether; and scepticism or agnosticism, which doubts the existence of a supreme being. The historical sources of monotheism are very ancient and involved, and need not be dealt with here. However, in the history of religious thought, three philosophical types of monotheism have developed which are distinct enough logically, if not practically, to make analysis possible.

The first type is exemplified in the later monotheism of the Israelitish tribes. The unity of God is derived from an ethical concept of the universe. God is one, holy and the righteous ruler of the world. He is the dispenser of justice, the giver of the law. He derives his power from the fact that he is the creator and, therefore, he enjoins upon his creatures ethical responsibility and heightened moral consciousness. Apart from the world, he sits in supreme jurisdiction over it.

In Greek philosophy we find the second type of monotheism, in which God as a unity or unifying principle is the source, the explanation of the order and rational coherence of the universe. According to Aristotle, he is at once the commanding general of the universe and the rational order of it.

The Hindu philosophy represents the third type. In its teaching, a distinction is maintained between the reality of the world and the reality of God. The earth on which man lives and its phenomena are of the «stuff that dreams are made»; it is ephemeral, transitory, unreal. God, who is imminent in all things, is at the same time transcendental, superior — the ultimate reality. Knowledge of God cannot be obtained by intellectual reasoning alone. It must come as a direct revelation by insight to those souls who are best prepared to receive it. Therefore, the contemplative life is to be desired and commended in preference to the practical. Logically, this mysticism argues that, since knowledge obtained through sensuous experience is at best defective and limited, some comprehensive perfect reality partaking of the nature of all things must exist somewhere — and this is the one God.

These various types of monotheism did not exist as pure concepts practically, however. The continued study of the problem of the relation of the world to God brought about interesting syntheses of these several philosophies. The intellectualism of Greek monotheism which conceived the «Logos» or divine essence of things to be the ruler and the order of things at the same time, soon found its position besieged by ethical questionings. How establish the proper relationship between a remote, righteous God who orders all things and a lawless unjust world? How reconcile, in other words, the Greek rational and the Jewish ethical monotheism? The Neo-Platonic school turned to mysticism for the solution. Likewise, early Christianity found itself beset with similar problems, and in its answer also found recourse to transcendental philosophy necessary. In Christian monotheism, a curious synthesis of all three monotheistic concepts is found, together with the doctrine of the personality of God. The ethical and mystical concepts predominate. The existence of a rational world is acknowledged to the point of fixing the ethical responsibility of human relationships. But beyond that, the things of the earth are untrue, imperfect, unreal. The whole truth is in God, of whom knowledge is obtained through insight and revelation. The concept of immortality solves the problem of injustice and evil, for in the after life all ethical readjustments are made. The Hellenistic concept of the universe as a well-ordered system capable of being fathomed by the intellect also survives in Christianity in the attempt to rationalize its doctrines and to build up a definite convincing system to establish the unity between the finite world and its infinite ruler.

Constant revivals of the third type of monotheism arise also out of the problem of synthetizing all three forms. The escape from the difficulties attendant upon the acceptance of any of the three per se is generally in transcendentalism of some form or in scepticism. True monotheism must take into just consideration the ethical, rational and intuitional elements of religious philosophy.

Consult Martineau, J., ‹A Study of Religion› (Oxford 1888); Inge, W. R., ‹Christian Mysticism› (London 1899); Royce, J., ‹The World and the Individual› (New York 1900–01); Höffding, H., ‹The Philosophy of Religion› (New York 1906); King, I., ‹The Development of Religion› (New York 1910); Lang, A., ‹The Making of Religion› (3d ed., New York 1910).

MONOTHELITES (Greek, *monothelētai,* from *monos,* and *thelō,* I will), a sect who maintained that though Christ had two natures coexisting distinctly in the unity of the person, yet these natures possessed or acted by but a single will — the divine, which so predominated over or absorbed the human as to deprive it of all action or efficiency. They have been regarded as an offshoot of the Monophysites, though they themselves denied all connection with them. The doctrine originated with the Emperor Heraclius, who in 630, by adopting a middle course, attempted to reconcile the Monophysites to the orthodox church. The attempt was for a time successful. Heraclius consulted Sergius I, patriarch of Constantinople, on the new dogma, and he not only approved of it, but became its most active propagandist. At his instance, and mainly in consequence of his representations, Pope Honorius I addressed two letters to Sergius, which according to some interpreters would seem to favor Monothelism. The successors of Honorius condemned the Monothelites, and Martin I, in 649, issued a bull anathematizing them. For this he was sent prisoner to the Chersonesus by the Emperor Constans, who protected the Monothelites. The sixth ecumenical council, that of Constantinople (680), condemned this heresy, and with this the early controversies on the incarnation became gradually fainter, till they were forgotten amid the disputes between the Iconoclasts and their opponents.

MONOTREMATA, an order of mammals belonging to the subclass *Prototheria* (q.v.) and represented by the duckbill (q.v.) of Australia and Tasmania, and the spiny anteaters (see ECHIDNA), the range of which extends into New Guinea. In many respects they recall the *Sauropsida* and especially the birds, a fact reflected in the name *Ornithodelphia* sometimes applied to them. The most marked of these peculiarities are the obliteration of the sutures of the skull, the possession of a terminal canal (cloaca) into which both the digestive tract and the urogenital organs empty; the possession of a well developed coracoid bone; and the fact that they do not, like other mammals, bring forth living young, but lay eggs. After the eggs are laid they are transferred to a temporary pouch beneath the abdomen, where they hatch and the young are nourished by the mammary glands.

MONOTYPE. See COMPOSING MACHINES.

MONOXIDE, *in chemistry,* a compound consisting of one atom of oxygen united to one atom of another divalent substance, or of one atom of oxygen united to two atoms of some other monovalent substance. The word is used when it is necessary to distinguish two or more states of oxidation of the same substance. Thus CO is called «carbon monoxid,» in distinction CO_2, which is called «carbon dioxid.» Similarly Na_2O is «sodium monoxid,» while Na_2O_2 is «sodium dioxid.» See OXIDE.

MONREALE, môn'rā-ä'lā, Italy, town in the Sicilian province Palermo, five miles southwest of Palermo city and connected with it by surface car tracks. It is the seat of an archbishopric, has a well-preserved cathedral (built 1174–89) with old bronze doors and beautiful mosaics, monumental graves of Normanic kings; also there is a Benedictine abbey dating from the 12th century with a magnificent cloister of 216 mosaic pillars and large library. Among its other public edifices are a gymnasium and a lyceum. In 1911 it had 20,103 inhabitants.

MONRO, mŭn-rō', **Alexander,** Scottish anatomist: b. London, 8 Sept. 1697; d. Edinburgh, 10 July 1767. He studied at Edinburgh, afterward in London under Cheselden, and still further both in Paris and Leyden, at the former under Bouquet, and at the latter under Boerhaave. On his return to Edinburgh in 1719 he was made professor of anatomy and surgery to the surgeon's company; in 1720, the first university professor of anatomy, though not inducted till 1725. He attended the wounded on the field at Prestonpans (21 Sept. 1745), and was an accurate observer, having studied the effect of the presence of solid bodies in the vermiform appendix, and otherwise anticipated later views. He resigned his professorship in 1764. His principal work is 'Osteology, a Treatise on the Anatomy of the Human Bones' (1726), once a popular textbook.

MONRO, Alexander, known as Secundus; Scottish anatomist: b. Edinburgh, 20 May 1733; d. there, 2 Oct. 1817. He was son of Alexander Monro, called Primus (1697–1767) (q.v.). Educated at Edinburgh University (M.D. 1755), he also studied on the Continent, and in 1759–1808 lectured at Edinburgh. In 1783 he described the communication between the lateral ventricles of the brain, known as the foramen of Monro. He published 'Three Treatises on the Brain, the Eye, and the Ear' (1797) and other medical works.

MONRO, Alexander, known as Tertius, Scottish anatomist: b. Edinburgh, 5 Nov. 1773; d. Craiglockhart, near Edinburgh, 10 March 1859. He was the son of Alexander Monro (1733–1817) (q.v.). He obtained his M.D. at Edinburgh in 1797, was appointed conjoint professor with Monro Secundus of medicine, surgery and anatomy, and in 1817–46 was sole professor. His works include 'Observations on Crural Hernia' (1803), and other publications.

MONRO, Dana Carleton, American historian: b. Bristol, R. I., 7 June 1866. He was graduated (1887) at Brown University, then studied (1889–90) at the universities of Strassburg and Freiburg. He was instructor and assistant professor of Roman and mediæval history (1893–1902) at the University of Pennsylvania, and professor of European history (1902–15) at the University of Wisconsin. In 1915 he accepted the chair of mediæval history at Princeton University. He received the degree L.H.D. from Brown University in 1912. From 1894–1902 he was editor of *Translations and Reprints from Original Sources of History,* and has written 'Mediæval History' (1902); 'A Source Book of Roman History' (1904); 'Syllabus of Mediæval History' (7th ed., 1913); 'German War Practices' (1917), and was a collaborator on 'Essays on the Crusades' (1902) and 'Mediæval Civilization' (1904).

MONROE, Harriet, American author: b. Chicago, Ill., 23 Dec. 1860. She was graduated from the Visitation Academy, Georgetown, D. C., in 1879 and has since devoted herself to literature. In 1889 she wrote the text of the cantata given at the opening of the Chicago Auditorium and in 1891 wrote by request of the committee the 'Columbian Ode' which was sung at the dedicatory ceremonies at the World's Columbian Exposition in 1892. She has published 'Valeria and Other Poems' (1892); 'John Wilborn Root — a Memoir' (1896); 'The Passing Show — Five Modern

Plays in Verse' (1903); 'The Dance of the Seasons' (1911); 'You and I — Poems' (1914). In 1912 she established and became editor of *Poetry*, a magazine of verse.

MONROE, James, fifth President of the United States: b. in Westmoreland County, Va., 28 April 1758; d. New York, 4 July 1831. His father, Spence Monroe, was descended from Hector Monroe, an officer of Charles I; while his mother, Eliza Jones, of King George County, was of Welsh descent. Monroe attended William and Mary College, but with the outbreak of the Revolutionary War he became a lieutenant in a Virginia regiment (1776). He was with his troops at the battle of Harlem Heights, White Plains and at Trenton, where he distinguished himself, being wounded in the shoulder. During the campaign of 1777–78 Monroe served on the staff of Lord Stirling with the rank of major, taking part in the battles of Brandywine, Germantown and Monmouth. As staff officer Monroe lost his place in the Continental army, and failing to raise a new regiment authorized by the legislature of Virginia, Monroe withdrew from active military services, confining himself to volunteer efforts in defense of his State. In this capacity he attained the rank of lieutenant-colonel in a new regiment to be raised in Virginia. In 1780 his military services were definitely interrupted and concluded by his undertaking the study of law under Thomas Jefferson, then governor of the State. So began the life-long friendship and intimacy between these two representative Virginians. In 1782 he was elected to the Virginia legislature, and although still a very young man, was appointed to the executive council. From 1783 to 1786 he served in the Congress of the Confederation where he played a conspicuous part in endeavoring to strengthen the Confederation's powers for the regulation of commerce, and the favorable report of the special committee appointed as the result of his motion on this topic contributed to the ultimate alteration of the articles. Monroe also disclosed a lively interest in the development and division of the West, on the right of the United States to the navigation of the Mississippi, on the subject of trade between the States and in the public lands. On retiring from Congress he began the practice of law at Fredericksburg, Va.; but in 1787 he was chosen a member of the Virginia legislature and in 1788 a member of the State convention to ratify the Federal Constitution. In this convention Monroe sided with the opponents of the new draft, and in the two main speeches which he made — characterized as «dull and weighty» — he objected to the ratification on account of «the power of direct taxation, absence of a bill of rights, the lack of legislative and executive responsibility, and the re-eligibility of the President.» In 1790 he was selected by the legislature United States senator to fill the vacancy caused by the death of William Grayson. From 1790 to 1794, as United States senator, he was classed as one of the most decided Anti-Federalists of the administration of Washington. Yet, in 1794 he was appointed Minister to France to succeed Gouverneur Morris, at the same time Jay was sent to England. These were troublesome days for American commerce when the United States endeavored to preserve its strictly neutral attitude in the death struggle between France and England. Morris had made himself unpopular to the Republican government of France, and undoubtedly one reason for Monroe's appointment was his well-known opposition to England. In other words, Monroe's selection was «forced by the exigencies of the situation.» It was hoped that Monroe's well-known French inclinations would harmonize the strained relations between France and the United States. He was instructed to assure France of the firm friendship of the government; the determination of the United States to maintain strict neutrality; to help adjust outstanding disputes between the two lands over spoliations, but to refrain from negotiating a treaty of commerce; and to quiet French suspicions regarding the Jay mission. Monroe was not informed of the wide latitude of Jay's instructions toward negotiating a treaty of commerce with Great Britain. Trouble therefore ensued, due to the fact that Monroe's French sympathies caused him to act indiscreetly on certain occasions; and also to the fact that he was not fully in the confidence of his home government concerning the Jay negotiations. Accordingly, in 1796, he was recalled because the Federalists criticized his republicanism and his failure to appease the French. Nevertheless, he had accomplished almost all the points set forth in his instructions by securing the recall of the French decree injuring American commerce, by protecting the interests of American citizens in France, by securing treaties with Algiers and Spain and by maintaining peace between the United States and France.

On his return to America, Monroe published, in December 1797, a defense of his conduct in a pamphlet of 500 pages entitled «A View of the Conduct of the Executive in the Foreign Affairs of the United States as connected with the Mission to the French Republic during the years 1794–96.» The pamphlet was widely circulated and aroused much discussion throughout the nation. In 1799 Monroe was chosen governor of Virginia and occupied this office until 1803, when he was appointed by President Jefferson as Envoy Extraordinary and Minister Plenipotentiary to France to aid the resident Minister, Robert R. Livingston, in obtaining the territory at the mouth of the Mississippi, including the island of New Orleans, as an outlet for the traders of the West, and to coöperate with Charles Pinckney, our Minister at Madrid, for cession of the Floridas. By the secret treaty of San Ildefonso (October 1800), Spain had ceded Louisiana to France, and in 1801 the Spanish intendant had given notice that New Orleans «would no longer be a 'place of deposit.'» This had aroused the inhabitants of the West and had occasioned the appointment of Monroe. However, by the time Monroe had reached Paris, Napoleon had given up his scheme of a colonial empire, and through one of his ministers had offered all of Louisiana to Livingston. On the arrival of Monroe, the two Ministers determined to exceed their instructions and so negotiated the purchase of Louisiana. In the same year he went as Minister to England and while there he met Nicholas Biddle of Philadelphia, who was then touring Europe. A friendship sprang up between the young man and the Minister which continued throughout their lives and ultimately resulted in Biddle's appointment by President Monroe as one of the directors of the Second Bank of the United States. In 1804 he proceeded to Spain to help Pinckney define the boundaries of Louisiana and acquire the Floridas. Failing to accomplish his purpose, Monroe returned to England where, assisted by William Pinckney of Maryland, a treaty was drawn up (December 1806) between England and the United States. But the treaty failed to provide against the impressment of American seamen and to secure indemnity for American losses, and accordingly Jefferson «pigeon-holed» it. In 1807 Monroe returned from England only to find his conduct the subject of much discussion; this called forth a pamphlet in defense, and for a time caused an estrangement between Monroe and Jefferson. In 1810 he was elected to the Virginia legislature, and in 1811 governor of the State, which office he held from January to November, when he resigned to become Secretary of State under Madison. He held this office until his election as President, during part of the time acting as Secretary of War. In both offices he displayed energy and diligence.

In 1816 Monroe was elected President by the Republican party, receiving 183 electoral votes against 34 for Rufus King, the Federalist candidate. His administration marks the advent of what is erroneously called the «era of good feeling,» when political rancor is supposed to have ceased. As a matter of note during his administration the first crisis of the slavery issue took place, resulting in the Missouri Compromise in 1820 and the Seminole Campaign of 1817, laying the foundation for the political strife of the Jacksonian era. In 1820 he was re-elected, receiving all the electoral votes but one, and this was cast by an elector of New Hampshire for J. Q. Adams, in order, it is said, that no one might share with Washington the honor of a unanimous election. The important events of Monroe's two administrations are the Seminole Campaign, 1817–18; the acquisition of Florida, 1819; the Missouri Compromise, 1820; the veto of the Cumberland Road bill on constitutional grounds in 1822, and his celebrated message of 2 Dec. 1823, setting forth the Monroe Doctrine (q.v.). In 1825 Monroe retired to private life and took up his residence in Loudoun County, Va. He took part in the Constitutional Convention in 1829 called to revise the State constitution. In his later years, owing to financial difficulties, he was forced to seek aid from Congress, which body in 1826 authorized the payment of $30,000 to him, and after his death the purchase of his papers. He died in New York in 1831, and in 1858, the centennial year of his birth, his remains were reinterred with solemn ceremonies at Richmond, Va.

Theodore Roosevelt has characterized Monroe as «a very amiable gentleman, but distinctly one who comes in the category of those whose greatness is thrust upon them.» This statement is undoubtedly true. Monroe was not a good speaker, he lacked tact and was often indiscreet, and he often allowed party feelings to get the better of his own judgment. Yet he was highly respected by his associates, and retained their friendship and admiration until his death.

Bibliography.—'The Writings of James Monroe' (7 vols., New York 1898–1903; edited by S. M. Hamilton); Gilman, D. C., 'James Monroe' in 'American Statesmen Series' (Boston 1898); Bond, B. W., 'Monroe's Mission to France, 1794–1796' (in 'Johns Hopkins Studies,' Vol. XXV, Baltimore 1907); Cox, I. J., 'The West Florida Controversy, 1798–1813' (Baltimore 1918); Irelan, J. R., 'History of the Life, Administration and Times of James Monroe' (in Vol. V of 'History of the Republic,' Chicago 1887). Consult also standard histories of the United States.

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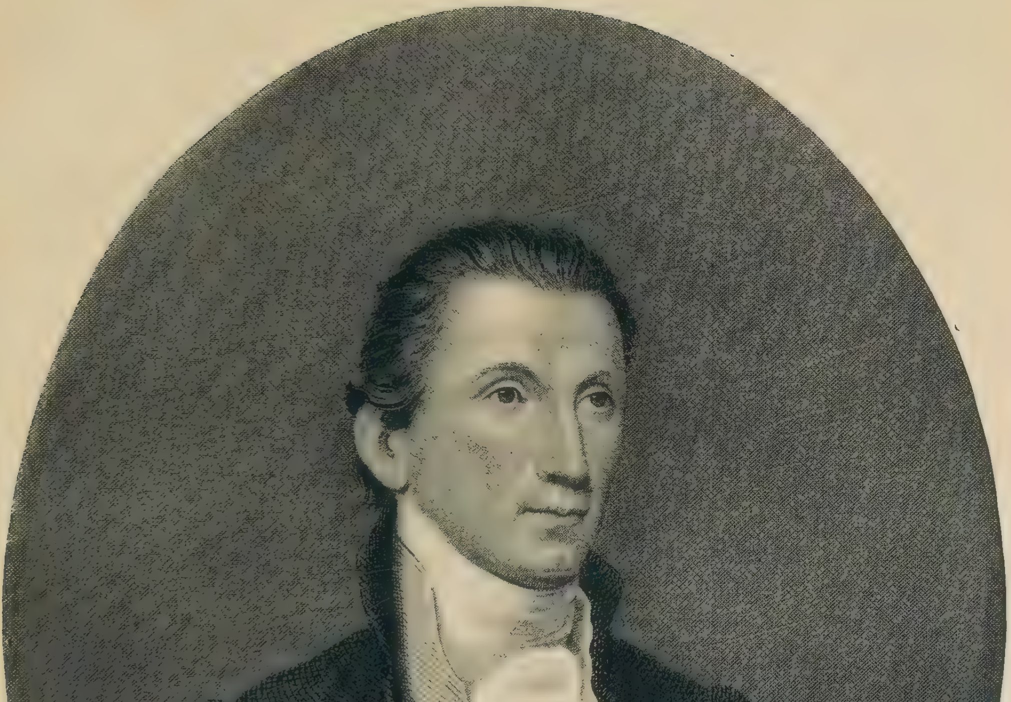
MONROE, La., city, parish-seat of Ouachita Parish, on Ouachita River, and on the Missouri Pacific and the Vicksburg. S and P. railroads, Arkansas and Louisiana Midland Railway and L. R. and Monroe Railway, about 155 miles north by west of Baton Rouge and 97 miles east of Shreveport. It has steamer connections with New Orleans and way towns on the bay. It is in an agricultural section in which raising cotton, corn, oats, cattle and hogs and lumbering are the chief industries. There are cotton-seed oil mills, cotton compresses, brick yards, lumber mills and woodenware factories. Pop. (1920) 12,675.

MONROE, Mich., city, county-seat of Monroe County, on the Raisin River, and on the Michigan Southern, the Père Marquette, the Michigan Central and the Lake Shore railroads, about 40 miles southwest of Detroit and 85 miles southeast of Lansing, the State capital. Was settled in 1784 by people from Canada, and was first called Frenchtown. In 1815 the name was changed to Monroe in honor of James Monroe (q.v.). It was chartered as a city in 1836. Here took place 22–23 Jan. 1813 the «Battle of Raisin River.» (See Frenchtown, Battle of). The city is in a fertile agricultural region and a trade centre for a large section of the southeastern part of the State. Its principal manufactures are flour, lumber, paper, paint, brick, agricultural implements, stoves, furnace products, furniture and canned goods. The nurseries nearby and the fisheries give employment to a number of people. The chief buildings are the courthouse, opera-house, armory and two orphan asylums, a home for the aged, Saint Mary's Academy, a public library and a convent. It has the mother house of the Sisters of the Immaculate Heart of Mary, a teaching order of sisters who have schools in various parts of the country, and whose pupils number about 10,000. In connection with the convent and academy are a large library and a fine museum. Pop. (1920) 11,573.

MONROE, N. C., city, county-seat of Union County, on the Seaboard Air Line Railroad, about 120 miles in direct line southwest of Raleigh. It is in a cotton-growing region, and nearby are gold mines. Municipal enterprise includes waterworks and electric-lighting plant. The chief industrial establishments are cotton mills, cotton gins, lumber mills and iron works, with an active trade in their products, and tobacco. Pop. 4,084.



JAMES MONROE

Fifth President of the United States

MONROE, Wis., city and county-seat of Green County, on Chicago, Milwaukee and Saint Paul and Illinois Central railroads, 40 miles south by west of Madison. It is situated in a cheese-making and dairy cattle-breeding region, Green County manufacturing more foreign type of cheese than any other county in the Union. Over 15,000,000 pounds of cheese are shipped annually. Industrially the condensing of milk and manufacturing of carriages, wagons, lumber and foundry products lead. Telephone, gas and electric companies are privately owned and waterworks is operated by municipality. It has excellent public schools and a fine library, which contains 8,000 volumes. In 1859 Monroe was incorporated as a village and chartered as a city in 1882. Pop. (1920) 4,788.

MONROE DOCTRINE, The. The term «Monroe Doctrine» has been popularly used for a variety of principles intended to explain or to define the policy of the United States toward Latin-American countries. The same words have had very different meanings at different periods of our history, but are now generally used to declare that it is contrary to the interest of the United States that any European powers should establish new settlements or colonies in any part of the Americas, or should exercise preponderant influence in Latin America. The whole subject may best be taken up under the following topics: (1) Conditions of the doctrine from 1775 to 1823. (2) Monroe's Doctrine as stated in his message of 1823 and applied down to 1845. (3) Theories as to Latin America put forward by Presidents and Secretaries of State from 1845 to 1900. (4) The modern doctrine of «the paramount interest» of the United States in American affairs, as developed since 1901. (5) The present status of the doctrine in our relations to European, Asiatic and American powers.

I. Conditions of the Doctrine (1775–1823). — The prime reason for the Monroe Doctrine was the rise of a new kind of nation in the western hemisphere. Down to the American Revolution all the occupied parts of both continents and the Caribbean basin were simply outlying parts of European countries and shared in the religion, institutions, law, foreign policy and wares of their mother countries. They were in the same situation as Africa at the present time, a group of dependencies, incapable of direct influence upon the world at large.

The Revolution, with its theories of the right of every people to choose their own government, resulted in the creation of the first American state. The new United States had no territory, claims or ambitions outside of the continent of North America. During the French Revolution and Napoleonic wars it stood aside as a neutral and insisted on several new principles of neutral rights in trade and citizenship. Europe quickly saw that this example was likely to be followed elsewhere and was not surprised when in 1806 the colonies of Spain and Portugal in the New World began to drop off. In 15 years the process was completed, for by 1821 not a Spanish colony remained loyal except Cuba and Porto Rico; and Brazil was forever lost to Portugal.

These new communities appealed to the example of the United States, imitated its government and expected its friendship. By 1823 there appeared on the map the independent states of Mexico, Colombia, Peru, Chile, La Plata, Haiti, Paraguay and Brazil. In the West Indies and on the north coast of South America small colonies remained to Great Britain, France, Holland, Sweden and Denmark. These, with Canada and the British plantation of Belize, were the only American colonies remaining to Europe. America boasted no longer a single star of liberty, but a brilliant constellation of independent republics.

The people of the United States felt a natural and deep interest in what seemed a repetition of their own experience of breaking away from a mastering European government. They welcomed the liberal trade opened up to them in regions where for centuries Spain had restricted communication. They enjoyed the sensation of being the pioneers and leaders in what they hoped was a world movement in democracy.

The new states at once demanded recognition by their elder sister. In 1822 President Monroe, under powerful pressure from Henry Clay and other statesmen, received authority to recognize the new countries, and soon exchanged ministers with Colombia, Chile, Mexico, Brazil and LaPlata. This step gave the certificate of the American Republic to the new freedom of her neighbors. It committed the United States to the principle that they were self-sustaining, self-governing, genuinely independent and entirely separated from their former European connections. They were too confidently accepted as equal sister states, a part of a free America.

II. Monroe's Original Doctrine (1823–1826). — This feeling of confidence in the continuance of the new governments received a severe shock when the combination of central European powers, commonly called the Holy Alliance (q.v.), after crushing several attempts at liberal government in Europe, turned its attention to Spain and to the Spanish colonies. A French army, with the mandate of the Holy Alliance, in 1823 overran Spain and restored the royal despot to power. The Bourbon monarch naturally asked for the application to these revolted colonies of this principle of supporting the legitimate sovereign. Metternich, the grand master of the Alliance, thought well of the idea, and it was discussed at the Congress of Verona of 1822. The United States feared that France would undertake this commission also, and would claim Cuba as the price of the service to Spain, thereby securing a broader foothold in America and gaining a rich island almost overlooking the American coast. The tension was increased by the attitude of Russia on the northwest Pacific Coast, where the tsar claimed exclusive ownership of the mainland and islands as far south as the 51st parallel by an imperial ukase dated 4 Sept. 1821. The Russians also asserted the right to keep the vessels of other powers out of the north Pacific Ocean.

The United States was thus pressed in two directions by what looked like an attempt of several European powers to come in and occupy the territories wrested from Spain and the unsettled part of North America. For many years the government had been practising the

«Policy of Isolation,» which was early laid down by Washington, Hamilton, Jefferson, John Adams and other statesmen. Its purport was that the United States had no share in European political combinations, was not a party to European wars and would pursue the policy of developing itself as an American state. From this policy it was an easy transition to the complementary doctrine that European powers ought not to interfere in American affairs.

The time seemed to have come in 1823 for some sort of action that would head off the threatened invasion of Latin America by third parties in behalf of Spain. Something was also needed to check the Russian advance into North America; and the opportunity was convenient for expressing the undying love of Americans for the popular government that they had chosen. At this moment George Canning, Foreign Minister of Great Britain, stepped into the controversy. England was interested in unrestricted trade with the Spanish-American countries and was extremely opposed to the constricting policy of the Holy Alliance, both in Europe and America. Hence, in August and September 1823, Canning four times proposed to Richard Rush, our Minister in London, that the United States join England in a declaration against intervention, and Monroe was inclined to accept the proposal. After long Cabinet discussions John Quincy Adams, Secretary of State, convinced the President that it would be better to make an independent declaration. Adams' papers show that he not only suggested but formulated most of the important presidential message of 2 Dec. 1823, several passages in which, construed together, constitute the original and genuine Monroe Doctrine.

The principal points in this declaration, which is the original form of the Monroe Doctrine, are substantially as follows: (1) *The two spheres.* The whole statement is based upon the theory that there were two natural spheres of world influence, separated by a meridian drawn through the Atlantic Ocean; and that the European and the American regions had two different sets of political and commercial interests. Since the United States took no part in the affairs of the European sphere it was common sense that European powers should keep out of American affairs. (2) *Intervention.* The message assumed that the Latin-American states were permanently independent and capable of conducting civilized governments; and it explicitly and strongly protested against «any interposition for the purpose of oppressing them, or controlling in any other manner their destiny, by any European power.» (3) *Colonization.* «The American continents, by the free and independent condition which they have assumed and maintain, are henceforth not to be considered as subjects for future colonization by any European powers.» This was directed against Russia but had a general bearing and has often been cited as applying to all European powers. (4) *Political system.* Monroe held that it would be hostile and dangerous to the United States if «the allied powers should extend their political system to any portion of either continent.» This clause plainly refers to the mutual assistance given by members of the Holy Alliance; but history shows that Adams and Monroe both meant to protest against the principles of absolutism in government — and were replying to a reference to the European «political system» in a recent Russian state paper. (5) *Protection of the United States.* The fundamental reason for setting forth the principles just stated was not America's interest in the Latin Americans but in the United States. Many statesmen then felt an apprehension that, after having subdued the Latin Americans in the South, the Holy Alliance might move its forces northward. (6) *Geographical extent.* The doctrine in terms excepts from its application the then existing European colonies, which meant Canada, Cuba, Porto Rico, the English and French West India islands and the three South American plantations. From that day to about the time of the Spanish War of 1898 there was little objection to the continuance of the old colonies. (7) *Peace.* Clearly the Monroe Doctrine was intended to keep the peace — to prevent wars from breaking out in other parts of America and to avoid dangers to our own republic. In that respect the doctrine has been an eminent success. With the exception of the French invasion of Mexico in 1861, no serious or devastating wars have taken place between Latin-American and European countries.

The original Monroe Doctrine was at once effective. Canning was so much interested in the result that he claimed it for himself and said (21 Dec. 1826): «I looked another way . . . I sought for compensation in another hemisphere. . . . I called the new world into existence to redress the balance of the old.» In reality it was John Quincy Adams who struck out the policy and clothed it in a set of appropriate phrases for his country. European intervention was abandoned; but when our Latin-American neighbors asked for a more distinct promise of military protection, at the Panama Congress of 1826, the United States took the ground that our neighbors must protect themselves in case of a fight with European powers; that the Monroe Doctrine was only a pledge by the United States to itself.

III. Enunciations (1845–1900).— In the 75 years from 1826 to 1900 a variety of official statements were made on Latin America by Presidents, Secretaries of State and other statesmen; and from time to time new questions were raised as to the application of the Monroe Doctrine to new circumstances. Out of these may be selected the following, as the principle attempts to state and apply the doctrine. (1) Van Buren, Webster and other statesmen, from 1829 to 1843, gave public notice that the United States would not permit the transfer of Cuba to any other European power; an extension of the doctrine to prevent the transfer of colonies from one European power to another. (2) President Polk in 1845 and 1848 favored the annexation of parts of America which might be in danger of European dominion. This statement was backed up by the Mexican War, as a practical demonstration that the United States was not bound by the Monroe Doctrine to refrain from enlarging her territory at the expense of Latin-American states. (3) In the disputes over the Clayton-Bulwer Treaty in the fifties, the principle of the Monroe Doctrine was invoked against the British colony in Honduras, on the ground that it was an extension of European influence. (4) Secretary Seward, undoubtedly in accord with President Lincoln, from 1861 to 1865 warned the French not to force a foreign empire upon unwilling Mexicans, and in 1865 Seward gave formal notice that the French must leave Mexico, which was backed up by a display of military force on the border. Though Seward avoided the term Monroe Doctrine, he applied its principles very effectively. (5) President Grant in 1869 repeated Polk's warning by announcing that no territory in America could be transferred to any European power, whether the inhabitants were willing or unwilling. (6) Secretary Fish in 1870 proposed that the United States should take the lead in a general political and commercial policy for the republics of America. This is the first distinct statement of a policy of leadership by the United States, which had undeniably been in the mind of John Quincy Adams. (7) Secretary Evarts in 1880 was the first American statesman to see the relation of the Isthmus Canal to the Monroe Doctrine. He claimed «paramount interest» for the United States in any land or water communication across the American isthmus. President Hayes added the significant declaration that any inter-oceanic canal would be «virtually a part of the coast line of the United States.» (8) Secretary Blaine in 1881 made the position of the United States more precise by stating that for any European power to share in the construction and control of the canal would be an introduction of the European political system. (9) Secretary Blaine drafted for the Panama Congress of 1889 the statement that the «principle of conquest» should not be considered as admissible under American public law. This was intended to apply to the wars between Latin-American powers, and also to foreign invasion. (10) Secretary Olney in 1895 went to the farthest point in a protest addressed to Great Britain, in relation to a boundary dispute between that power and Venezuela. He stated that the Monroe Doctrine «has been the accepted public law in this country ever since its promulgation»; he thought «any permanent political union between an European and an American state unnatural and inexpedient»; he asserted that «to-day the United States is practically sovereign on this continent and its fiat is law upon the subjects to which it confines its interposition.» President Cleveland restated the same principle in the words «The Monroe Doctrine finds its recognition in those principles of international law which are based upon the theory that every nation shall have its rights protected and its just claims enforced.»

This series of utterances, along with others of a similar tenor, clearly show a steady growth of responsibility and authority in American affairs. The Panama Canal brought out many rival interests between the United States and European powers, and the State Department at Washington insisted that it was for this government and no other to decide where, how and when the canal should be constructed. Secretary Olney and President Cleveland pushed the doctrine far beyond any previous statement. Their doctrine was certainly not the original Monroe Doctrine, for it really laid down the new principle that Great Britain, which for nearly three centuries had been one of the leading American powers, was no longer to exercise influence on Central and South America. Olney's farther expressions, if carried to their logical outcome, would justify the United States in doing anything and taking anything in North or South America that seemed desirable, under penalty of the hostilities at which President Cleveland distinctly hinted.

IV. Modern Doctrines (1901–19).— So far as the relation of Great Britain to American affairs was concerned the Olney Doctrine was successful, for Great Britain took the lesson to heart, accepted the arbitration with Venezuela which was thrust upon her, cheerfully accepted the finding of the arbitrators (which were almost entirely in her favor) and prepared to give up that joint control of the Canal which was embodied in the Clayton-Bulwer Treaty of 1850. During the Spanish War of 1898, Great Britain made it clear that other European powers must not interfere with the American policy of the United States. The next step was for Great Britain in the first Hay-Pauncefote Treaty of 1900 freely and without consideration to give up the joint control over isthmus transit. The Senate insisted that there should be a formal abrogation of the Clayton-Bulwer Treaty and Great Britain gave way and accepted the second Hay-Pauncefote Treaty of 1901, by which the United States was left free to control any isthmus canal that might be constructed and to «neutralize» it in her own way.

When England was fairly out of the way, Germany loomed up on the horizon. That power for some years had been looking about the world for an opportunity to plant colonies, and was supposed to have a special interest in South America. President Roosevelt took up this question and in 1902 faced the issue of intervention by European powers in Venezuela. This was one of the Latin-American states which objected to foreigners coming in and occupying a privileged status superior to that of natives, by calling on their home governments to press claims for the fulfilment of contract and for damages for personal injuries.

A combination was made between Germany, Great Britain and Italy which prepared to land forces on the Venezuelan coast and hold part of the country till the claims of the subjects of those countries were satisfied. The great Brazilian jurist, Calvo, had laid down what was known as the Calvo Doctrine, to the effect that foreign governments ought not to use even diplomatic methods in behalf of private claims. Drago, Foreign Minister of the Argentine Republic, during the Venezuelan crisis proposed a modification, commonly called the Drago Doctrine (q.v.), which was to the effect that no intervention ought to be allowed to enforce the obligation of contracts, whether made by individuals or by the government. This principle was accepted by President Roosevelt as reasonable and was afterward incorporated into The Hague Conventions of 1907.

When it came to the actual dispatch of the fleets, President Roosevelt demanded from the German government a point blank statement that they would not land or occupy Venezuelan territory. The promise was reluctantly given and was kept. The squadron therefore contented itself with blockades and captures of vessels on the coast and mild bombardments.

The Venezuelans finally agreed to arbitrate and the fleets were withdrawn.

The episode led the mind of President Roosevelt to consider what ought to be done in cases where Latin-American countries went beyond the negative refusal to execute contracts and advanced to attacks on the persons, property or diplomatic representatives of a foreign country. He, therefore, in various public speeches and messages declared that the Monroe Doctrine was intended to be one of peace, and that to keep the peace the United States might be forced in flagrant cases "to the exercise of an international police power." This is the so-called "policy of the Big Stick," and President Roosevelt and his successors proceeded to apply it in various cases.

(1) In 1902, Cuba which had been released from Spain by the Spanish War, was obliged to consent to the Platt Amendment, to the effect that the nominally independent state must not incur any obligations to foreign countries which would interfere with the interests of the United States. This virtually made Cuba a protectorate of the United States. (2) In 1903 the infant republic of Panama ceded the canal strip to the United States and entered into a treaty which left it also a dependency. (3) In 1905 President Roosevelt made an agreement with the government of the Dominican Republic to administer its customs, setting apart a portion of the proceeds for the public debt service. Santo Domingo thus ceased to be a really independent country. (4) In 1911 President Taft made a similar arrangement with Nicaragua. (5) In 1915 Haiti entered into a financial arrangement which virtually placed it under United States control and provided for an American receivership of customs.

In every instance the reason for this assumption or acceptance of authority over Latin-American republics was based upon the belief that otherwise some foreign country would come in and interfere with American interests and threaten the future of the country affected. That is, the United States acquired six protectorates lest some European power might have cause to descend upon them by armed force. A supposed attempt of Japan in 1912 to secure a footing at Magdalena Bay on the west coast of Mexico led to the adoption by the Senate of a resolution introduced by Senator Lodge against such occupation for naval or military purposes. Ex-Secretary Root in 1914 attempted to show that the Monroe Doctrine did not require the United States to exercise a domination over its neighbors. President Wilson also in public statements and addresses in 1913 disclaimed any ambition of the United States to extend its territory in America. The only way to reconcile these statements with the facts of our protectorates is to admit that the Monroe Doctrine is a check to the territorial greed of European powers but does not restrain the United States from bringing portions of Latin America under her influence.

V. Present Status.— The war of 1898, including the annexation of the Philippine Islands by the United States, was a frank admission that there were no longer two spheres in modern world politics. Eastern Asia is honeycombed with European settlements and interests, and the occupation by the United States, of the Philippine Islands, near China, makes us near neighbors of Russia; France and Great Britain. On the other side, at the conference of Algeciras in 1906, the United States accepted membership on the pressing invitation of the German emperor and had the determining voice in the result. It was therefore, no longer possible for our government to insist that European powers must keep out of America because we keep out of European affairs. The Japanese have been thought to have some designs on the western coast of North or South America which would be contrary to the Monroe Doctrine. At the other extreme was the danger, which for a time was feared, of German occupation of a part of Brazil or other South American countries. Should either danger ever occur the Monroe Doctrine would presumably become active.

As respects the Latin Americans themselves, they have always welcomed whatever protection the declarations and influence of their powerful neighbor might give against foreign aggression; but many of them fear that the United States will eventually seek extensive annexations to the southward. The taking over of the six protectorates and the great interest of the United States in the Mexican question heighten that apprehension. The growth and steadiness of the ABC powers — Argentine, Brazil and Chile,— with about half the total Latin-American population, give a more positive basis for permanent alliances and relations. It has been suggested that the Monroe Doctrine will naturally develop into some kind of Pan-American Union (q.v.) in which the United States will be the most populous and strongest member of a great American federation. The difficulties in the way of a permanent union between a country of 100,000,000 and 20 other countries which together aggregate 75,000,000 are hard to surmount.

The question of the right of a nation to exercise special authority over its neighborhood was raised in another form by the steady growth of Japanese power in Eastern Asia. On 30 Nov. 1908, by the Root-Takahira agreement, the United States recognized this special interest; and in November 1917, in the Lansing-Ishii agreement, went still farther in approving practically the doctrine of special interest, it being tacitly understood that Japan would in like manner respect the American Monroe Doctrine.

The negotiations of 1919 at the end of the Great War seemed for a time likely to weaken the Monroe Doctrine by substituting a system of world peace organization which would take the place of the earlier method, inasmuch as the League of Peace provided a machinery for hearing complaints and settling controversies such as were likely to arise between Latin American and European powers. A strong protest was made in public discussions on the subject in the United States. In the final form the covenant of the League of Nations included the following limitation: "The covenant does not affect the validity of international engagements, such as treaties of arbitration or regional understandings like the Monroe Doctrine, for securing the maintenance of peace."

This clause would seem to be a guarantee of the special relation of the United States to Latin America; and so far as ratified by those States would bind them to accept the doctrine as a «regional understanding.» It is likewise a reaffirmation of the Japanese Monroe Doctrine, and is likely to be claimed in support of spheres of interest in the Mediterranean, Asia and Africa. Acceptance of the treaty by most world nations is therefore an assertion of the right of powerful nations in various parts of the earth to exercise a general protection over groups of small or weak powers, and at the same time to exclude external powers from interfering with the leadership of the strongest power in such a combination.

Bibliography.— Adams, J. Q., ‹Memoirs› (Vol. VI, 163; 177–179; 186–216); Blakeslee, W., ‹Latin America› (1914); Channing, Hart and Turner, ‹Guide to the Study of American History› (1912); Ford, W. C. (in *American Historical Review,* Vol. VII, p. 676; Vol. VIII, 28); Hart, A. B., ‹The Monroe Doctrine, An Interpretation› (1916); Henderson, J. B., ‹American Diplomatic Questions› (1901); Kraus, ‹Die Monroedoktrin› (1913); Moore, John Bassett, ‹Digest of International Law› (1906); Paxson, F. L., ‹Independence of the South American Republics› (1903); Polk, J. K., ‹Diary of James K. Polk› (1910); Reddaway, W. F., ‹The Monroe Doctrine› (1898); Richardson, ‹Messages and Papers of the Presidents› (1896–99); Roosevelt, Theodore, ‹Theodore Roosevelt: An Autobiography› (New York 1913); Rush, ‹Residence at the Court of London› (1855); Sherrill, ‹The Monroe Doctrine› (1916). Discussions of the Monroe Doctrine in the press and periodicals during the discussions of 1918 on the League of Nations.

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MONROVIA, Cal., town in Los Angeles County, on the Atchison, Topeka and Santa Fe Railroad, about 19 miles east of the city of Los Angeles and 10 miles east by south of Pasadena. It has a healthful climate and a beautiful situation near the southern border of the San Gabriel National Forest. It has extensive fruit-growing interests and is a thriving progressive town with modern improvements. Pop. (1920) 5,480.

MONROVIA, mŭn-rō′vĭ-ạ, Liberia, the capital of the West African Republic, a commercial and seaport town, on Cape Mesurado near the mouth of the Saint Paul's River. It has regular steamship service by British and Spanish vessels, direct cable communication with Europe and New York, and two wireless stations. It exports rubber, palm kernels and oil, pissara fibre, cocoa, coffee, ivory, ginger, camwood and annatto. A college is maintained by the government and one by Methodists; missions are carried on by Catholics and American Protestants, and the city is the see of a Protestant Episcopal bishop. Monrovia was named after James Monroe, President of the United States. Pop. (with Krutown) 6,000.

MONS, môṅs, Belgium, the capital of Hainault, on the Trouille, 38 miles by rail southwest of Brussels. An encircling belt of promenades occupies the site of the fortified ramparts demolished in 1862. The Canal de Condé connects Mons with the Scheldt. The church of Saint Waldru (1450–1589) is a masterpiece of Gothic; and there are a town-hall (1458), a belfry (1662) 275 feet high, a good library, etc. The manufactures include woolen and cotton goods, cutlery, hardware and sugar; while in the vicinity is the extensive coal field of Borinage. Mons, occupying the site of one of Cæsar's camps, was made the capital of Hainault by Charlemagne in 804. France, Spain and Austria often contended for its possession. The battlefields of Malplaquet and Jemappes are in the neighborhood. In 1914 Mons was captured by the Germans in their advance on Paris, and around Mons some of the severest fighting occurred during the progress of the war. See War, European. Pop. about 28,000.

MONS. See Mensa.

MONSEIGNEUR, môṅ-sā-nyėr (French my lord), a title of dignity in France. Before the Revolution the king's oldest brother was styled *monseigneur.* Princes, dukes and peers, archbishops, bishops, cardinals, marshals of France, presidents of Parliament, etc., were addressed by this title.

MONSELL, mŭn′sĕl, **James Samuel Bewley,** Anglican clergyman and hymn-writer: b. Londonderry, Ireland, 2 March 1811: d. Guilford, England, 9 April 1875. He was graduated at Trinity College, Dublin, in 1832, and took orders in the Church of England in 1835. As a writer of hymns he became famous, over 100 of his hymns still continuing in popular use. Among his publications are ‹Parish Musings›; ‹Simon the Cyrenian and Other Poems›; ‹Spiritual Songs›; ‹Our New Vicar› (1867; 13th ed., 1890).

MONSIGNORE, mŏn-sē-nyō′rĕ, a title of honor given to prelates of the Roman Catholic Church. Prior to the Revolution in France the corresponding title of Monseigneur was allowed to all high dignitaries of the Church, but its use was forbidden in 1801 by a law of the French Convention.

MONSIGNY, mȯṅ-sē′nyē, **Pierre Alexandre,** French composer: b. Fauquemberg, 17 Oct. 1729; d. Paris, 14 Jan. 1817. He went at an early age to Paris and was appointed, under the influence of the Duke of Orleans, majordomo. He studied counterpoint under Gianotti and composed a series of comic operas which were highly successful, to be followed, with equal success, by grand opera plays. But the Revolution, having robbed him of his position and his fortune, he lived his later days on a pension from the Opera Comique, becoming (1815) a member of the Academy. Among his most popular operas were ‹Les aveux indiscrets› (1759); ‹Le cadi dupe› (1760); ‹Le roi et le fermier› (1762); ‹Le déserteur› (1769), his most prized work; and ‹Le Faucon› (1772), which was very popular. Consult Pougin, A., ‹Monsigny et son temps› (Paris 1908).

MONSON, mŭn′sȯn, Sir **Edmund John,** British diplomat: b. Chart Lodge, Kent, 6 Oct. 1834; d. 29 Oct. 1909. He was educated at Eton and Balliol College, Oxford; was Fellow of All Souls, Oxford, 1858; had entered diplomacy in 1856; held various minor posts, as attaché or under-secretary, until 1876, when he was sent on special service to Dalmatia and Montenegro. He was Minister to Uruguay (1879), to Argentina and Paraguay (1884), to Denmark (1884), to Greece (1888), was appointed arbitrator of the Butterfield claims between Denmark and the United States in 1888, Minister to Belgium 1892, Ambassador to Austria 1893, and to the French Republic 1896–1904. He was made a Privy Councillor in 1893. His decision in 1900, in favor of the action of the Danish authorities in 1854–55 at the island of Saint Thomas, disposed of the claims of the two American vessels belonging to Butterfield and Company. In 1903 he received the order of the G.C.V., and was knighted in 1905.

MONSOONS, mŏn-soonz', *in meteorology,* are certain winds, operative from the tropic of Cancer to lat. 7° S., and from the coast of Africa through the Indian Ocean and the Bay of Bengal to Japan and the western Pacific. There are two monsoons, the southwestern and the northeastern. The latter prevails from October to April, and the former from April to October. Monsoons are caused by the unequal heating of the land and water and of the several land masses themselves in the regions which they affect. Independently of their great use in bringing rain to countries which otherwise would degenerate into deserts, they are useful for navigation. As in the case of the trade winds, navigators of sailing vessels plan their voyages to take advantage of the monsoons. Consult Ferrel, W., 'A Treatise on the Winds' (New York 1889).

MONSTERS. See TERATOLOGY.

MONSTRANCE (Lat., *monstrare,* to show), called also *ostensorium* or *expositorium,* the sacred vessel in which, in the Roman Catholic Church, the host is shown to the people, through a glass-covered opening, at benedictions, processions and other solemnities. Its use dates from the institution of Corpus Christi Day (1264) by Pope Urban IV. It was not until after the Council of Cologne 1452 that the consecrated wafer was exhibited to the people, having been previously deposited in the ciborium which enclosed and concealed it.

MONSTROSITY. In anatomy and physiology any deviation in form or function so great as to be noticeable may be termed a monstrosity by the extension of the term. But it is customary to consider as true monstrosities only such deviations from the normal as are excessive. Supernumerary fingers, toes, legs, arms, etc., or the absence of any or all of them from birth are not called true monstrosities. Deviations from the normal in form or function are almost limitless, the study of them being otherwise known as teratology. The subject of human teratology has been systematized by Saint Hilaire and slightly modified by Hirst and Piersol and is as follows: (1) Hemiterata are all abnormal developments which are not true monstrosities, lacking the element of excess, with the exception of excess in numbers referred to. They include, however, anomalies in size such as dwarfs and giants, anomalies in form of head, pelvis, etc., of color such as albinism or melanism, of position, including curvature of the spine, hernia, clubfoot, etc., of continuity, including imperforate esophagus, rectum or vagina. (2) Heterotaxes, which include the anomalous position of heart, liver, etc. (3) Hermaphrodites, which according to the definition of Ahlfeld are those individuals which possess sexual glands both masculine and feminine, but show all possible variations of one sex organ upon the other. (4) True monsters, where there are either more or less than the normal number of legs, arms or there are no heads or rudimentary heads or two or more. This group also contains what are called omphalositic monsters which are embryos attached to an original fœtus and depending on it for what nourishment and development they can get. The best-known type of monsters, those which have been frequently exhibited, are the composite monsters of which the Siamese Twins and the Tocci Brothers are examples. Other illustrations are of children with two bodies joined together at the pelvis but having no legs, and the bodies pointing in opposite directions. There are also terata with two heads and two faces or with one head and two faces like the ancient conception of the god Janus.

It is almost impossible to imagine any deviation in form, function or size which has not been recorded, since the curiosity of mankind has been such as to be attracted from time immemorial to anything in the nature of the marvelous. The composite monsters on record have shown almost all varieties of union of lower extremities and of reduplication of both lower and upper; and of the partial or total reduplication of the entire body, the climax being reached in the twins which are united by only a comparatively small cartilage. Double monsters are either parasitic or independently nurtured as was the case of the Siamese Twins, who lived to the age of 63 years. There are also known triple monsters, one case being recorded by Saint Hilaire of a three-headed child who was born in Italy in 1832.

The very unpleasant side of anatomic teratology has its more cheerful compensation in the records of extraordinary developments in vitality and fecundity and in the recovery of many persons who have suffered accidents or other misfortunes ordinarily found fatal, or who have shown remarkable abilities of adaptation to apparently impossible conditions. For not only do we see the monstrosities of fatness and leanness, the people with elastic skin, the bearded women, etc., but there have been recorded a large number of cases of extraordinary ability to function in spite of adverse circumstances. Examples of teratology of function are seen in suspended animation, a case being recorded of a man who could, apparently at will, cause his heart to stop beating. He succeeded once in prolonging this inactivity of the heart for about 30 minutes. The function appeared to be restored automatically. A post mortem examination of his heart showed nothing extraordinary. Other illustrations of purely physiological wonders without, however, showing any other abnormality are seen in very high temperature. One case is on record of a man whose temperature ran up to 148° and was between 120° and 125° for five days in succession.

Among anomalies of excess in function are to be included also mental prodigies such as extraordinary memory and other mental functions of which one of the most remarkable was Jacques Inaudi born in 1869 in Piedmont. He had an extraordinary mathematical ability which enabled him to perform mentally operations with numbers in the billions and trillions.

He had no other unusual ability. Many prominent men such as Edmund Burke, John Locke, Pascal, Liebnitz and Euler were noted for supernormal memory. Another mathematical prodigy was a man named Rube Fields of Johnson County, Mo., who added columns of figures as rapidly as they were read to him, and performed incredibly enormous operations in multiplication. He was an uncultivated boorish man with no other mental ability worth mentioning.

These facts are of importance from the point of view that the average individual probably possesses powers of endurance, toleration of disease and of mental development far above that which the ordinary person acquires, and that the mine of human abilities has up to the present age not merely not been worked but has probably not even been more than sampled. What may be the cause of this relatively undeveloped mentality in men in general is suggested by the recent investigations into the unconscious mental activity.

MONT BLANC, môṅ blōṅ (white mountain), France, a mountain, the loftiest of Europe, belonging to the Pennine chain of the Alps, and rising 15,781 feet above sea-level, the main portion and the highest summit being in France (Haute Savoie), seven miles south of the Switzerland frontier. It forms a huge mass stretching northeast and southwest, in which direction the boundary line between France and Italy runs along it. Its northeastern extremity enters Switzerland. In this latitude the snow line is at 8,000 feet; consequently 7,700 feet of the mountain are within the region of perpetual snow and ice. Its shape, when seen on the north or south, is pyramidal. On the southeast it presents an immense wall-face, on which few glaciers can be formed. These, of which 18 in all are counted, are chiefly on the northwest slope, where the glaciers Des Bossons, Bois, Talèfre and Mer de Glace are seen. The mass of the mountain consists almost entirely of granite. In 1760 the scientist, Saussure, offered a prize for the discovery of a practicable passage to the summit, which was reached by Jacques Balmat, a guide, June 1786. The «Grande Ascente» in the 19th century became an ordinary tourist excursion, regularly made every season by great numbers and is now facilitated by the railway built up to a short distance from the summit by French engineers. In 1893 an observatory was erected on the summit of the mountain by Pierre Janssen.

MONT CENIS, môṅ sẽ-nē, or **MONTE CENISIO.** See CENIS, MONT.

MONT CERVIN, môṅ sĕr-văṅ. See CERVIN, MONT.

MONT PELÉE, môṅ pā-lā. See PELÉE, MONT.

MONT-DE-PIÉTÉ, môṅ-dė-pē-ā-tā (in Italian *Monte di Pietà*), an authorized licensed or government pawnshop; a bank of charity which lends money on pledges at a low rate of interest, and whose aim is purely philanthropic. The chief customers of such institutions, which are found in France, Italy, Germany and other Continental countries, are workmen pressed by a temporary failure of employment; small tradesmen without a bank account; or travelers in a large town whom some accident has subjected to a momentary strait; to all of whom it is a matter of necessity to conceal any compromise of their position in procuring money for present necessities. These institutions were established to prevent the scandal and abuse of usury. They date their origin from the Middle Ages, when the loan of money on pledges was almost exclusively in the hands of the Jews. They originated in Italy about 1450, and not long after were approved by several papal bulls. Several French and Italian cities possessed monts-de-piété in the latter half of the 15th century, among others, Mantua, Parma, Milan, Rome, Padua, Trèves, Boulogne, etc. The French monts-de-piété, with the exception of those of Montpellier, Toulouse, Grenoble and Angers, which lend without interest, exact interest at the rate of from 4 to 12 per cent. The chief mont-de-piété in France is that of Paris, which transacts a greater amount of business than all the rest together. In the United States and Great Britain pawnbrokers take the place of monts-de-piété, which were introduced in the beginning of the 18th century, but failed. See also GOVERNMENT PAWNSHOPS IN FRANCE; PAWNBROKERS.

MONT-SAINT-MICHEL, môṅ-săṅ-mē-shĕl, France, a famous seat of learning and pilgrimage resort of Normandy as early as the 12th century, now an equally celebrated tourist resort. It consists of a collection of mediæval houses, hostelries, ecclesiastical buildings, and fortifications, grouped on a conical rock in the Bay of Cancale or Saint Michel, at the mouth of the Couesnon River, here forming the boundary between Normandy and Brittany, 15 miles southeast of Granville. Anciently a lofty hill in the forest of Scissy which was submerged in the 7th century by a tidal cataclysm, the rock in prehistoric times was crowned by a Celtic temple; it was the Roman *Mons Tumba*, and the «*mons in periculo maris*» — the mount in danger of the sea — of the monastic chroniclers. The Bay of Saint Michel, 15 miles wide at its mouth, and 8 miles long from north to south, is nearly dry at low water, but fills with treacherous rapidity at flood tide. In 1880 a dyke nearly a mile long was completed which connects the Mont with the mainland. Ramparts, towers and bastions of the 16th century encircle the base of the rock which has a circuit of about two miles, and the entrance is through a gate which opens on the single, narrow, winding street of a small village (pop. 250) built around the southern slope and leading by several flights of stone steps to the fortified abbey on the summit. Crowning the abbey is a superb 15th century Gothic basilica, a fine statute of the Archangel Michael capping the spire, which towers conspicuously 250 feet above the wide expanse of sandy bay and low-lying country around. Saint Aubert, bishop of Avranches, founded the abbey in 709 and his first chapel, restored, is on a rocky projection on the north side of the Mont. In 1203 the abbey was destroyed by Philip Augustus, and the present buildings date from that period. It was an important fortified post during the English and religious wars and was successfully defended against all assaults by the Knights of the Order of Saint Michael. At the Revolution it was converted into a prison for political offenders, and now ranks as one of the protected historical monuments of France. An elaborate process of restoration since 1863 has renewed its ancient strength and beauty. Among the chief features of the Mont are the abbey church, elaborately decorated cloisters, La Merveille, «the marvel,» or massive north wall of the abbey, the Salle des Chevaliers, the Châtelet or guardhouse, the crypts with their remarkable columns, the cellars, the dungeons, the mediæval elevator with its enormous hoisting wheel formerly operated by a donkey, etc.; and in the village the ancient parish church, a museum, the famous Porte du Roi and Duguesclin's Tower.

MONTAGNA, Bartolommeo, bär-tō-lōm-mā'ō mōn-tän'yä, Italian painter: b. Orzinovi, near Brescia, about 1450; d. Vicenza, 11 Oct. 1523. He settled at Vicenza in 1480, was influenced by Bellini, Carpaccio and Andrea Mantegna, worked in Padua and Verona, and from 1496 until his death was again in Vicenza, being the first great master resident there. His work in general resembles the earlier Venetian school, is serious, marked by distinctness, power and severity of drawing, and has harmonious coloring in which a brown gleaming tint is noticeable. The human form is almost always shown as over-muscular. His principal works are the ‘Madonna and Child’ at the Venice Academy, ‘Ecce Homo’ at the Louvre, frescoes in the church of San Nazaro at Verona and an altar piece in the Brera, Milan. In the Johnson collection at Philadelphia he is represented by a ‘Madonna with Saints’ and in the New York Metropolitan Museum by ‘A Lady of Rank as Santa Bibiana’ and a ‘Madonna and Child.’

MONTAGNAIS (môṅ-tän-yā) **INDIANS,** a general name applied to several American Indian tribes. One of these, of the Athapascan family in British North America, were Christianized by Roman Catholic missionaries. Another and best-known tribe of this name was of the Algonquian family, and resided along the shores of the Saint Lawrence River. They have practically disappeared in recent years.

MONTAGNARDS, môn-täṅ-yär (Fr., mountaineers), a popular name in French history, applied in 1793 to the radical democratic party, the leaders in the French Revolution and its excesses. Soon after the fall of Robespierre the denominations of «Montagnard» and «Montagne» gradually disappeared from party nomenclature. After the Revolution of 1848 an abortive attempt was made by the extreme party in the National Assembly, under Louis Blanc and Rollin, to revive the title.

MONTAGU, mŏn'tạ-gū, **Andrew Jackson,** American lawyer and statesman: b. Campbell County, Va., 3 Oct. 1862. He was graduated at Richmond College in 1882 and studied law, taking the degree of LL.B. at the University of Virginia, 1885. He was admitted to the bar and began the practice of law in 1885; from 1894 to 1898 he was United States district attorney for the western district of Virginia, and in 1898–1902 attorney-general of the State. In 1902 he was elected governor of Virginia for a term of four years. He became one of the foremost advocates of direct primaries to prevent party machine rule. He was also active in the movement for improved popular education in the South, and gave many public addresses throughout the State, advocating the increase of educational facilities for all without regard to race or creed. In 1903 he received the degree of LL.D. from Brown University. From 1906 to 1909 he was dean of the Law School of Richmond College, and member of the 63d to 67th Congresses, 1913 to 1923, serving as delegate on various international conferences.

MONTAGU, Edwin Samuel, British statesman: b. 1879. He became Under-Secretary of State for India under Lord Morley in 1910, and his first budget speech a few months later in the House of Commons created a highly favorable impression. He entered the Cabinet as Chancellor of the Duchy early in 1915. He was Minister of Munitions in the first Coalition Government but retired with Mr. Asquith on the accession of Mr. Lloyd George. When Mr. A. Chamberlain resigned the Indian secretaryship in the summer of 1917, Mr. Montagu was chosen for the post. He proceeded to India to investigate the political situation of the country in association with the viceroy, with a view to the gradual development of self-government for India. In July 1918 their joint report on Indian constitutional reforms was issued. In the new Lloyd George Cabinet of January 1919 Mr. Montagu was reinstalled Secretary for India with a native under-secretary in the House of Lords, Sir S. P. Sinha (q.v.).

MONTAGU, Elizabeth Robinson, English author and society leader: b. York, 2 Oct. 1720; d. London, 25 Aug. 1800. In 1742 she married Edward Montagu, grandson of the first Earl of Sandwich, who died leaving her a fortune. To wealth she added literary accomplishments, and these, joined to other personal qualities, enabled her to secure her social leadership. Among her visitors and associates were Lord Lyttelton, Samuel Johnson, Horace Walpole, Burke, Sir Joshua Reynolds, Garrick, Hannah More and other celebrated persons. To the gatherings at her house the term bluestocking (q.v.) is said to have been first applied. Three of the dialogues in Lord Lyttelton's ‘Dialogues of the Dead’ were written by her in 1760. She also wrote an ‘Essay on the Writings and Genius of Shakespeare, compared with the Greek and French Dramatic Poets’ (1769). Much of her correspondence was published (1809–13). Consult the ‘Memoirs’ of Elizabeth Carter (London 1816); Doran, ‘A Lady of the Last Century’ (London 1873); ‘Elizabeth Montagu, the Queen of the Bluestockings; Her Correspondence from 1720–1761’ (2 vols., New York 1906); Huchon, R., ‘Mrs. Montagu and her Friends’ (New York 1907).

MONTAGU, Lady Mary Wortley, English author: b. 1689; d. 21 Aug. 1762. She was the eldest daughter of Evelyn Pierrepont, afterward Duke of Kingston. She learned Latin very early, and also became versed in English literature, especially its romance and drama. The Kit-Cat Club (q.v.) by acclamation admitted her to membership. In 1712, without the consent of her father, she married Edward Wortley Montagu, a wealthy Whig scholar, with whom the former had quarreled. On the accession of George I in 1714 Montagu obtained an official position in London, and Lady Mary came out from the seclusion in which she had lived. Her beauty, wit and vivacity gained her admiration and influence, and she became familiarly acquainted with Addison, Congreve, Pope and other distinguished writers. In 1716 her husband was appointed Ambassador to Turkey, and Lady Mary accompanied him to Constantinople, where they remained from January 1717 to May 1718. During this period her famous ‹Turkish Letters› were written. On her return to England she re-entered the world of wit and fashion. She had a quarrel with Pope, and a long and keen literary war ensued, which did honor to neither. In 1739, for reasons never satisfactorily explained, she left England to live on the Continent. This she did with the full concurrence of her husband. She lived chiefly in Italy until her husband's death in 1761, and soon after her return to England she herself died. Her letters are marked by great sprightliness, combined with graphic power and keen observation, and with independence of judgment. Lady Mary has another claim to remembrance in her courageous adoption for her own children of the Turkish practice of inoculation (q.v.) for smallpox, and for her energy in promoting its introduction into England in the face of violent prejudice. Consult her ‹Works,› edited by Lord Wharncliffe, her great-grandson (1837; latest ed., 1893); and Symonds, E. M., ‹Lady M. W. Montagu and her Times› (New York 1907).

MONTAGUE, Francis Charles, English historian: b. London, 31 Aug. 1858. He was educated at University College, London, and graduated (M.A.) at Balliol College, Oxford, became (1881) Fellow of Oriel and was called to the bar in 1884. He has been, since 1893, professor of history at University College, London; lecturer in modern history since 1897 at Oriel College, Oxford. He was curator of Indian Institute, Oxford (1900–13). He wrote ‹Limits of Individual Liberty› (1885); ‹Life of Sir Robert Peel› (1888); ‹Elements of English Constitutional History› (1894). He contributed to *Cambridge Modern History* ‹The History of England from the Accession of James I to the Restoration,› in Vol. VII; and to Longman's ‹Political History of England› (1907). He edited Macaulay's ‹Essays› (1903).

MONTAGUE, Mass., a town including several villages, in Franklin County, on the Connecticut River and on the Central Vermont and the Fitchburg railroads, about 35 miles north of Springfield. The most important village in the town is Turner's Falls, the location of a large electric-power plant. Montague was settled about 1716, and in 1753 was incorporated as a district. It is in an agricultural and manufacturing region. The chief industrial establishments are large cotton mills, paper and pulp mills, brick, water-wheels, hardware, cutlery, pumps, toilet articles, soap and machinery. There are three public libraries. The government of the town is determined by popular vote at regular town meetings. Pop. 7,675.

MONTAIGNE, mŏn-tān′ (Fr. môṅ-tān-yĕ), **Michel Eyquem de,** French essayist: b. Château Montaigne, Périgord, 28 March 1533; d. there, 11 Sept. 1592. He was educated by his father after a fashion all his own, learning Latin from house servants who never spoke French, and being roused from bed every morning by soft music. At six he was sent to the Collège de Guyenne in Bordeaux, where he stayed for seven years, apparently under the charge of the great classical scholars, Buchanan and Muretus. Thereafter he probably studied law at Bordeaux and Toulouse, and when he came of age was made a member of the Cour des Aides at Périgueux. This court was abolished three years afterward and Montaigne with the other members was appointed counsellor to the Bordeaux parliament, a body in which he made the acquaintance of La Boétie about 1559. For the next few years he was at court, now at Paris, now at Bar-le-Duc; we know that in 1562 he swore allegiance to the Catholic Church on his own motion; that in 1565 he married Françoise de la Chassaigne, daughter of one of his fellow-counsellors, and that the death of La Boétie in 1563 and that of his father in 1568 had greatly lessened Montaigne's interest in public affairs. These events had also no doubt sobered him — he admits that his youth had been wild; at any rate in 1571, having prepared La Boétie's posthumous works for the press, having received himself the Order of Saint Michel for a rather mediocre version of the ‹Theologia Naturalis› of Raymond de Sebonde, his only literary venture so far, after selling his post as counsellor, he retired to Montaigne. There he began, and in the next nine years completed, the first two books of his essays, whether purposing them for publication or not is unknown, though their style seems to point to the fact that in their earliest form they must have been mere jottings in a commonplace book. By the middle of 1580 his health had so much failed that he left Château Montaigne for the first time since 1571, save for an occasional trip to Paris, and traveled through Switzerland, Germany and Italy, meeting Tasso at Florence. His ‹Journal› of this trip, discovered and published in 1774, adds nothing to his literary fame and not much more to our knowledge of his personality. During this absence from France, and apparently quite against his will, Montaigne was elected mayor of Bordeaux; he served in this office from 1581 to 1583 and then was re-elected for another two years; at the close of this successful administration, in which with no small skill he had steered safely the king's lieutenant in Guyenne and the king of Navarre, governor of the province, he refused to be present in the city as was required for the election of his successor, because of the plague — one of the few lights on his personal character and not a pleasant one. The three years immediately following (1585–88) were occupied in the revision of his two books of essays and the addition of a third. He received the rites of the Church upon his death-bed. His wife bore him several children; «two or three,» he says, died in infancy; and one, a daughter of whom he was very fond, survived him. But his family ties were not strong; his life with his wife seems to have been a philosophic makeshift; and his love for his daughter cannot compare with his attachment to Mlle. de Gournay, a Parisian, who was attracted to him by his literary fame, was called by him his adopted daughter and was fortunate enough to receive from Montaigne's widow a copy of his ‹Essays› with manuscript additions and corrections, the basis of a new edition, published in 1595. Montaigne's literary reputation is safe, though in the hands of the few, not the many. His spirit is skeptical, essentially typical of his time, and it was not for nothing that his study at Château Montaigne was decorated with texts from Ecclesiastes, Ecclesiasticus, Lucretius and Horace, for he was akin to these ancient writers who proclaim the vanity of all things. His theme is varied, his treatment discursive and his charm largely due to this very variety, together with a quaintness and raciness of style that did much for French prose and was mostly original even if patterned on Amyot. His manner of approaching the questions of life and criticism is apparently purely subjective; indeed, his delightful egoism that makes his own life, experiences and thoughts the theme of the essays seems at first to be quite independent of so serious a purpose. But this subjective manner brings him nearly as close to the analysis of universal problems as does the dramatic objectivity of a Shakespeare. His entire attitude is skeptical, but he is not to be ranked as the enemy of religion. He is the curious, interested skeptic, not the doubting cynic. Professor Saintsbury well says that the nearest spiritual parallel to Montaigne in literature is Charles Lamb.

Montaigne affected English literature scarcely less than he did French. His essays, translated by Florio (1603), seem to have been known to Shakespeare in their English form, and this same version, revised by Hazlitt (1893), is still the standard in English. The best editions of the original are those by Amaury-Duval (1820) and Le Clerc (1865). (See MONTAIGNE'S ESSAYS, FLORIO'S TRANSLATION OF). Consult the appreciations by Emerson, ‘Representative Men’ (1850); Church, ‘Miscellaneous Essays’ (1888); Pattison, ‘Essays’ (1889), and Pater, ‘Gaston de Latour’ (1896); also Bonnefon, ‘Montaigne et ses Amis’ (1892); Stapfer, ‘Montaigne’ (1894); Lowndes, ‘Michel de Montaigne’ (1898); Guizot, ‘Montaigne’ (1899); Champion, ‘Introduction aux Essais de Montaigne’ (1900); Dowden, E., ‘Michel de Montaigne’ (Philadelphia 1905); Woodberry, G. E., ‘Great Writers’ (Garden City 1907); Sichel, E., ‘Michel de Montaigne’ (New York 1911).

MONTAIGNE'S ESSAYS, Florio's Translation of. The interest of Florio's translation of the essays of Montaigne is manifestly due in the first place to Montaigne and only very secondarily to Florio. The world has never failed to find the good-natured and wise father of the modern essay both amusing and interesting, and Montaigne, in whatever dress he might wear, would be sure of a welcome in any reflecting but not too serious society of men and women. Yet it is no small credit to Florio that he has not only kept Montaigne alive and to the fore in his translation, but has also managed to slip in by the way some considerable flavor of himself. His translation of his French original is not always accurate in detail, though it is perhaps not less accurate than translations customarily were in the days when it was made. It has something better, however, than simple verbal accuracy, it has color and life. Like most Elizabethan translators, Florio was seldom content to let a single English word stand as the equivalent of a significant word of his original. In order to be sure to get the full content of his French source, he amplified by the addition of intensifying modifiers and synonyms. The result is that the translation is often more wordy and more highly colored stylistically than the original, is often quaint and colloquially picturesque when Montaigne is simple and direct. Florio was above all a lover of the ingenious style, and his ingenuity not infrequently betrayed him into the grotesque. He was fond not only of strange words, but also of puns, alliteration and the other frippery of the courtly writing of his day. When it suited his convenience he did not hesitate to Anglicize a French word, with the result that though he put Montaigne «in English clothes» it was done «many times with a jerke of the French jargon.» Yet when one compares the ‘Epistle Dedicatorie’ of the translation, addressed to his «best-best Benefactors and most-most honored Ladies, Lucie Countesse of Bedford; and her best-most loved-loving Mother, Ladie Anne Harrington,» where he was writing in his own person, with the body of the translation, one notes with gratitude that Florio has not done his worst in the way of verbal ingenuity. His original exerted a salutary restraining influence when he came to the actual task of translating, and few readers will cavil at him for being occasionally Florio, since he really gives us Montaigne.

GEORGE PHILIP KRAPP.

MONTALEMBERT, Charles Forbes de Tryon, shärl fôrb dė trē-ôṅ môṅ-tă-lŏṅ-bār, COMTE DE, French publicist and historian: b. London, England, 29 May 1810; d. Paris, 13 March 1870. He received a university education at Paris; identified himself with the Liberal Catholic movement of Lamennais (q.v.) and Lacordaire (q.v.), whom he assisted in establishing (18 Oct. 1830) and editing *L'Avenir,* and in efforts to obtain the freedom of education at that time impossible under the state system, and in 1831 went with these two leaders to Rome to present their cause. On his return he opened with Lacordaire and De Coux at Paris a free Catholic school, which was promptly closed by the police, while the directors were arraigned for infringement of the laws respecting instruction. Montalembert made a notable defense before the Chamber of Peers, but the directors were sentenced to pay the costs and 100 francs apiece in fines. When the doctrines of *L'Avenir* were condemned by Gregory XVI in an encyclical of 15 Aug. 1832, Montalembert duly submitted and did not proceed with Lamennais to final revolt. He entered the Chamber of Peers in 1835, spoke much and eloquently on ecclesiastical matters, and in 1836 published his ‘Histoire de Sainte Elizabeth de Hongrie,’ which appeared in an English rendering by Hackett and Sadlier (1854). His Catholic zeal was combined with liberal ideas and after the Revolution of 1848 he was elected as a Moderate Republican to the Constituent Assembly; but here, as in the Legislative Assembly, where he sat from 1849 to 1857, he became more and more conservative. In June 1851 he debated against Victor Hugo in opposition to the proposed constitutional revision. He found himself unable to support the measures of the Empire; was known as one of the most determined opponents of Napoleon III; and for an article, ‹Un Débat sur l'Inde au Parlement Anglais,› unfavorably contrasting French and British institutions, was sentenced to six months' imprisonment and a fine of 3,000 francs, though the penalty was remitted. His chief work is ‹Les Moines d'Occident depuis Saint Bénoît jusqu'a Saint Bernard› (1860–67; Eng. trans.), which, though of much value, has been criticized as in general too argumentative and oratorical in manner to fulfil the highest demands of history. He wrote many pamphlets, the last of which, ‹La Victoire du Nord aux Etats-Unis› (1865; Eng. 1866), was an appreciation of the triumph of the Union cause in the Civil War. He opposed in a letter of 28 Feb. 1870 the opportuneness of the definition of the doctrine of papal infallibility, but acquiesced at once when the dogma was published. Consult the memoir by Mrs. Oliphant (London 1872); the study by De Meaux (Paris 1897); Craven, ‹Le Comte de Montalembert› (London 1873); Lecanuet, ‹Montalembert d'aprèsses papiers et su correspondence› (3 vols., Paris 1895–1905).

MONTALEMBERT, Marc René, Marquis de, French military engineer: b. Angoulême, 16 July 1714; d. Paris, 29 March 1800. He took part in a number of campaigns (1736–41) in Italy, Flanders and Germany and wrote during the following peaceful years several dissertations for the Academy, of which he became a member (1747). In the Seven Years' War he was chief of commissary, and directed the fortifying of Anklam and the strengthening of Stralsund. Later he fortified Oléron Island after his own system, newly worked out. He invented the low-framed gun-carriage. He wrote ‹La fortification per pendiculaire› (Paris 1776), and this, his chief work, was severely criticized, which caused him in self-defense to write ‹L'art défensif supérieur à l'offensif› (1796, 11 vols.).

MONTALVÁN, môṅ'täl-väṅ, **Juan Perez de,** Spanish dramatist and novelist: b. Madrid, 1602; d. there, 25 June 1638. He was already making success as dramatist at 17 years of age and was soon working with Lope de Vega. In 1625 he was ordained to the Church and became apostolic notary of the Inquisition. A collection entitled ‹Comedias› which distinguish themselves through their national attitude appeared in two volumes (Madrid 1635, Alcalá 1638 and 2d ed., Valencia 1652); seven plays are in *Biblioteca de autores españoles,* and eight novels of his in ‹Sucesos y prodigios de amor› (Madrid 1624, with frequent new editions), and others in Ochoa's *Tesoro de novelistas españoles* (Paris 1847); in ‹Paratodos› (Huesca 1633) are novels on morals and dissertations. His ‹Orfeo› (Madrid 1624) is a poem in octaves. On the death of Lope he wrote ‹Fama postuma de Lope de Vega› (Madrid 1636). Consult Bacon, G. W., ‹Life and Dramatic Works of Dr. J. P. de Montalván› (in *Revue Hispanique,* Vol. XXVI, Paris 1912): Fitzmaurice-Kelly, James, in *Bibliographie de l'histoire de la littérature espagnole* (ib. 1913).

MONTALVO, Garcí Ordóñez De. See Ordóñez De Montalvo, Garci.

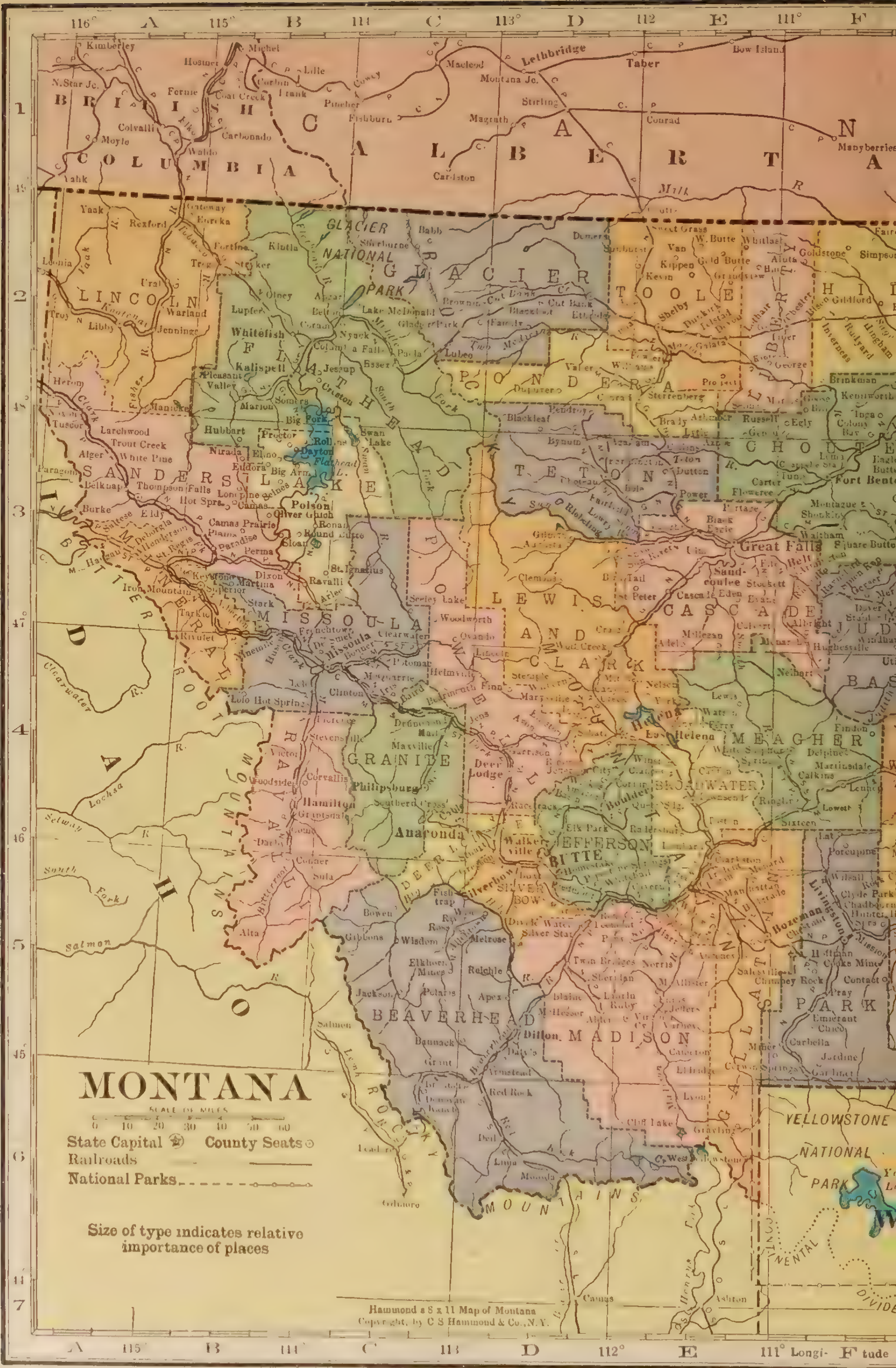
MONTANA, mŏn-tă'na, the «Treasure State» (admitted to the Union 8 Nov. 1889), is bounded north by Canadian provinces, east by North Dakota and South Dakota, south by Wyoming and eastern Idaho, west by Idaho. Capital, Helena; area, 147,182 square miles; population (1910) 376,056; percentage of increase in 10 years, 54.5; population (1920) 548,889; percentage of increase in 10 years, 46. The name is Spanish for mountain. The floral emblem of the State is the bitter-root. The yellow pine is the State tree. The State seal contains the words Oro y Plata, gold and silver.

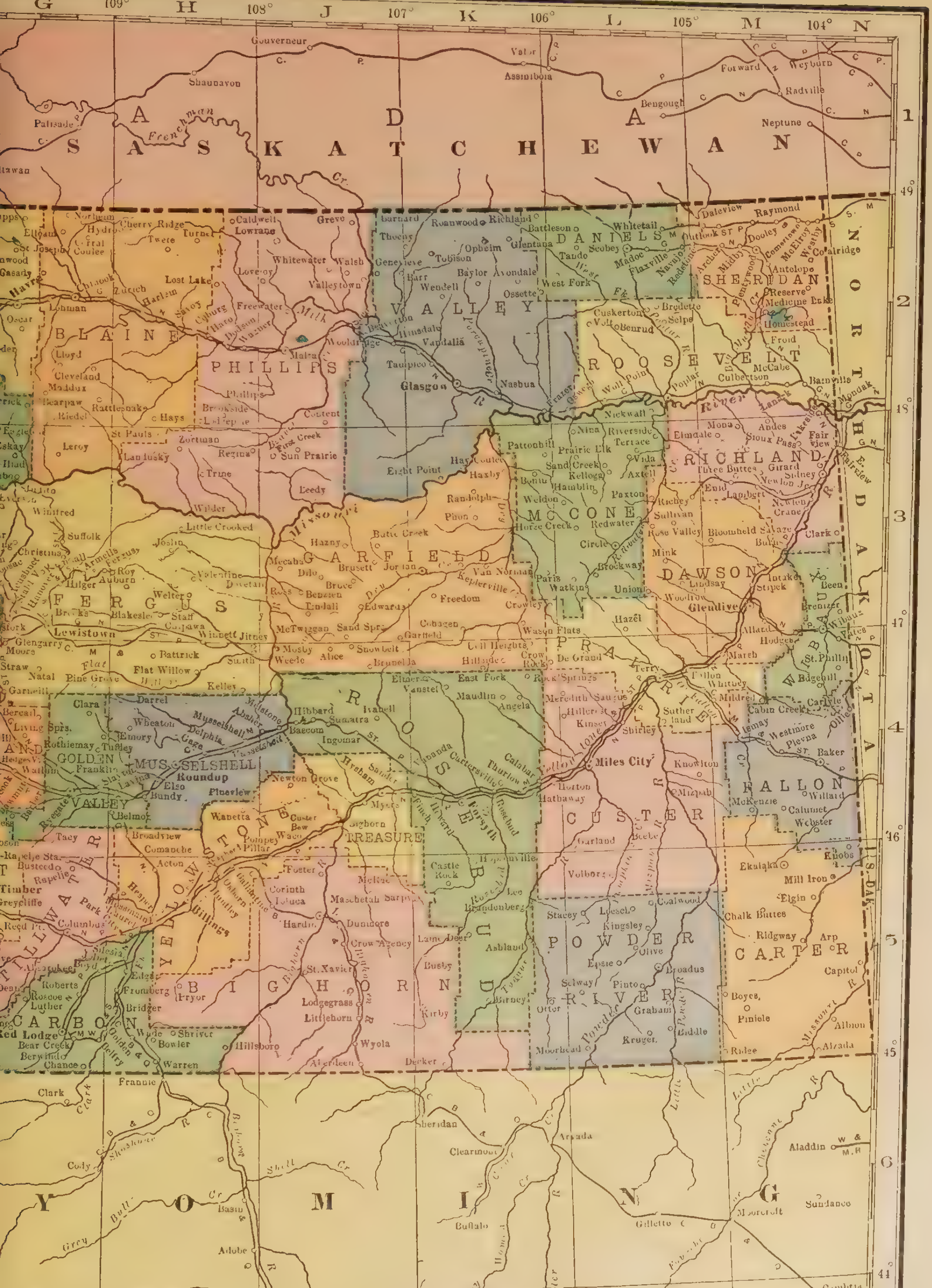
Topography.— The State has within its borders 94,196,780 acres of land. Of this amount approximately 26,000,000 acres are classed as mountain lands, 50,000,000 acres as farming lands and 18,000,000 acres as grazing lands. This is approximately 40,000 square miles of mountains, 78,000 square miles of farming lands and 19,000 square miles of grazing lands. The mountain area of the State is about equal to the area of either Indiana, Kentucky, Virginia, Ohio or Tennessee. Its grazing land is about equal in area to Delaware and Maryland. Its farming land embraces an area about as large as Michigan or Minnesota. The mountain area is mainly in the western part. The main range of the Rocky Mountains enters the State on the north at a point about a hundred miles east of the Idaho-Montana State line, and extends across the State from northwest to southeast, in a very tortuous line, leaving the State where the Divide enters Yellowstone National Park. Glacier National Park (q.v.) embraces a portion of the main range and outlying and projecting spurs. In this section is some of the finest scenery and sharpest peaks of the entire State, although the altitude of the mountains is by no means as high as in the southern part. Among the peaks included in Glacier Park are Cleveland (10,438), Merritt (9,948), Wilbur (9,293), Grinnell (8,836), Gould (9,541), Seyeh (10,004), Going-to-the-Sun (9,594), Red Eagle (8,800), Little Chief (9,542), Gunsight (9,250), Blackfeet (9,570), Stimpson (10,155), Pinchot (9,332), Jackson (10,023), Kintla (10,100). Hanging on these mountains are many glaciers, large and small, which give the name to the park. The most important of these glaciers are Agassiz and Kintla glaciers, on Kintla Peak; Rainbow glacier on Rainbow Peak; Carter glaciers on Mount Carter; Chaney glacier on Mount Merritt and the Divide; Sperry glacier on Edwards and Gunsight; Harrison glacier on Mount Jackson and Walton; Blackfoot glacier on Mount Jackson and Blackfoot; Pumpelly glacier on Blackfoot; Grinnell glacier on Grinnell and Gould; and Vulture glacier on Vulture Peak. About the middle of the State a portion of the main range is called the Anaconda Range, with Mount Haggin (10,598). Mount Howe (10,475) and Evans (10,635). Here the range makes a sweep to the west, then turns at a sharp angle southward, forming the boundary between Montana and Idaho. The remainder of this boundary line of mountains is made by the Bitter Root and Cœur d'Alene ranges. The higher portion of the former range is in projecting spurs, and includes Lolo (9,075), Saint Mary (9,335), Ranger (8,810), Ward (9,010) and El Capitan (9,936). The smaller ranges in the western part of the State are variously named. In the extreme northwestern part is the Kootenay, which extends northward into British Columbia. Between the Kootenay and the Bitter-Root Range are the Cabinet Mountains, extending approximately southeast and northwest, and continuing westward into Idaho. The Mission Range extends almost due north and south for about 100 miles, the northern end beginning in the valley at the upper end of Flathead Lake, rising higher toward the southern end, containing McDonald (10,100), Sinyaleamin (9,500) and McLeod (8,500). East of the Mission Range lies the Swan range, extending almost parallel with the former, and continuing much farther north. Like the Mission Mountains, the Swan Range is highest at the southern end, culminating in Swan Peak (over 10,000), and Baptiste. East of the main range are many small ranges, in some cases quite isolated, and in others connecting the Great Plains to the Continental Divide. The Big Belt Mountains form the boundary line between Meagher County on the east side, and Lewis and Clark and Broadwater counties on the west. The range extends from northwest to southeast for more than a hundred miles. Between Chouteau and Cascade counties are the Highwood Mountains, a range of beautiful summits, including Highwood (7,600), Middle (7,000) and Arrow (7,420). The Little Belt Mountains are between Meagher and Cascade counties. The highest summit is Neihart (9,000); Thunder Mountain is 8,000. Between the Little Belts and the Crazy Mountains further south are the Blue Mountains, the Elk Range and the Castle, a series of crags with an elevation of 8,606. The Crazy Mountains, the first mountains the traveler is likely to see as he speeds along the railroad near Bigtimber, lie partly in Meagher and partly in Park counties. They contain some beautiful mountains, Crazy Peak (11,178), Sunlight (10,087), Conical (10,731), Loco (9,187) and Fairview (8,400). In Fergus County, which is about as large as the State of Massachusetts, are three small ranges called the Big Snowy, the Little Snowy and the Moccasin mountains. In the southern part of the State, just north of Yellowstone Park, in Park County, are the Absaroka Mountains, also called the Snow Range, with some high summits, whose majestic snow caps are seen 100 miles away. Among these are Pyramid (10,760), Haystack (10,990), Emigrant (10,969), Cowan (11,190), The Needles (10,939), Douglas (11,300), and Sheep (10,620). East of the Absarokee Range, and bordering the State line, are the highest mountains in the State, the Beartooth Range, culminating in Granite Peak, with an elevation of 12,850. Extending north and south in Gallatin County is the Gallatin Range, with many lofty and beautiful summits. Among these are Blackmoon (10,196), Hyalite (10,110), Twin (10,246), Bighorn (10,000) and Gallatin, between the Gallatin and Madison ranges (10,967). Also in Gallatin County, and north of the Gallatin Range, is the Bridger Range, with Bridger Mountain as the highest point (9,106). This range also contains a mountain named for the Indian Bird Woman who accompanied the Lewis and Clark expedition, Sacajawea. West of the Gallatin Range, in Madison County, are the Snow Crest Range, the Ruby Mountains, the Tobacco Root Mountains and the Madison Range. The last named contains the Sphynx (10,000), and the Wedge (10,606). Along the Wyoming boundary, and east of Yellowstone Park, are the Pryor Mountains, in Bighorn County, and still farther east are the Rosebud Mountains. In the extreme southeastern part of the State is the High Plateau Ridge. Southeast of Billings is a long elevation called Pine Ridge, which in level countries would be called mountains, but which in comparison with the high ranges is not so called. In the central part of the State near the eastern boundary, in Wibaux and Dawson counties, is a series of high and wooded hills called the Blue Hills. In the central portion, Sweet Grass County, is a range called the Sweet Grass Hills. In the eastern and northern part of the State is a series of isolated buttes, some of them of sufficient size and extent to be called mountains. Among these are Mountain Sheep Bluffs, nearly 100 miles long. Between the Yellowstone and Missouri rivers, and between Yellowstone and Musselshell counties, are the Bull Mountains, the location of a big field of coal. North of the Missouri River are several important small ranges, although the larger portion of the country is in the plains country. Where Chouteau, Hill and Blaine counties join is located the Bear Paw Range, culminating in Mount Garfield (5,794), Hancock (5,078) and Centennial (6,074). Much of the mountainous region is yet unexplored, save by the hardy trapper and prospector. The transcontinental railroads give the traveler a poor idea of the sublimity of the scenery which the mountain ranges afford. Many of the peaks, lakes, glaciers and creeks are unnamed. Owing to the varied topography and elevation of the State there is great variation in the soil and climate, resulting in corresponding variation in occupations of the people.

River Systems and Lakes.— Montana is unique in one respect; unlike any other State or country, the waters from the mountains are carried by different river systems to the three oceans, the Arctic, the Pacific and the Atlantic through the Gulf of Mexico. In the western part the Bitter-Root River gathers the waters from the snow crests of the Bitter-Root Range and from the spurs of the Rockies, and unites with the Missoula near the city of Missoula. The Missoula River through its various tributaries gathers the waters from a large portion of the western slope of the main range, including that which is used in the great smelters of Anaconda, and that which comes from the rich mines of Butte. Further north, the North-Fork, Middle-Fork and South-Fork of Flathead River receive the drainage from the Mission and Swan ranges, the west slope of the main range and a part of the Kootenais. These unite to form the Flathead River, which first pours its waters into the greatest reservoir of the State, Flathead Lake, and later joins the Missoula in the beautiful but narrow Paradise Valley to form Clark's Fork of the Columbia. The Kootenay River takes the drainage from the extreme northwestern corner, a part of the Columbia drainage system. The rivers on this western side are clear and swift, with rocky and picturesque cañons. The Belly and Saint Mary rivers in the northern part of the main range carry the ice-cold water from the glaciers of the Continental Divide, Chaney, Swift Cur-

MONTANA

Absarokee, (G5)	150
Alberton, (B3)	150
Albright, (F3)	130
Alder, (D5)	150
Anaconda, (C4)	11,668
Antelope, (M2)	285
Arlee, (C3)	100
Armington, (F3)	100
Armstead, (D5)	100
Augusta, (D3)	350
Avon, (D4)	100
Bainville, (M2)	396
Baker, (M4)	1,067
Ballantine, (H5)	100
Bannack, (C5)	150
Basin, (D4)	650
Bear Creek, (C5)	744
Bearmouth, (C4)	100
Belfry, (H5)	250
Belgrade, (E5)	499
Belknap, (A3)	100
Belmont, (H4)	150
Belt, (F3)	967
Benchland, (F3)	250
Bernice, (D4)	100
Bigfork, (C2)	400
Big Sandy, (G2)	589
Bigtimber, (G5)	1,282
Billings, (H5)	15,100
Blossburg, (D4)	250
Bonner, (C4)	700
Boulder, (E4)	682
Bowler, (H5)	100
Bozeman, (F5)	6,183
Brady, (E2)	250
Bridger, (H5)	679
Broadus, (L5)	24
Broadview, (H4)	191
Browning, (C2)	986
Butte, (D4)	41,611
Cameron, (E5)	100
Canyon Ferry, (E4)	100
Cascade, (E3)	465
Castle, (F3)	100
Chester, (F2)	402
Chestnut, (F5)	150
Chinook, (G2)	1,217
Chouteau, (D3)	1,043
Circle, (L3)	245
Clancey, (E4)	300
Clinton, (C4)	100
Clyde Park, (F5)	352
Coburg, (H2)	140
Collins, (E3)	100
Columbia Falls, (C2)	611
Columbus, (G5)	987
Conrad, (D2)	988
Cooke, (G5)	100
Corbin, (E4)	150
Corvallis, (C4)	200
Craig, (D3)	100
Crow Agency, (J6)	100
Culbertson, (M2)	547
Custer, (J4)	150
Cut Bank, (D2)	1,181
Dagmar, (M2)	200
Darby, (B4)	325
Dayton, (B3)	100
Deborgia, (A3)	150
Deer Lodge, (D4)	3,780
Denton, (G3)	431
Devon, (E2)	200
Dillon, (D5)	2,701
Divide, (D5)	100
Dixon, (B3)	130
Dodson, (H2)	365
Drummond, (C4)	350
Dunkirk, (E2)	100
Dupuyer, (D2)	380
Dutton, (E3)	200
East Helena, (E4)	1,200
Eddy, (A3)	100
Ekalaka, (M5)	433
Electric, (F5)	400
Elkhorn, (E4)	150
Elkpark, (D4)	100
Elliston, (D4)	200
Ennis, (E5)	125
Eureka, (B2)	1,032
Fairfield, (D3)	160
Fairview, (M3)	513
Fallon, (L4)	100
Family, (D2)	130
Flaxville, (L2)	300
Forsyth, (K4)	1,838
Fort Benton, (F3)	1,065
Fort Keogh, (L4)	100
Fort Maginnis, (G3)	100
Fort Shaw, (E3)	380
Frazer, (L2)	140
Frenchtown, (B3)	300
Froid, (M2)	410
Fromberg, (H5)	520
Galata, (E2)	300
Gardiner, (F5)	500
Garneill, (G4)	150
Garnet, (C4)	250
Garrison, (D4)	100
Gateway, (A2)	150
Geraldine, (F3)	354
Geyser, (F3)	230
Gildford, (F2)	480
Gilman, (D3)	210
Gilt Edge, (G3)	300
Glasgow, (K2)	2,059
Glendive, (M3)	3,816
Grant, (C5)	100
Grantsdale, (C4)	190
Grass Range, (H3)	252
Great Falls, (E3)	24,121
Gregson, (D5)	100
Hall, (C4)	105
Hamilton, (C4)	1,700
Hardin, (J5)	1,312
Harlem, (H2)	721
Harlowton, (G4)	1,856
Harrison, (E5)	150
Havre, (G2)	5,429
Hays, (H2)	500
Hedgesville, (G4)	200
HELENA, (E4)	12,037
Helmville, (C4)	150
Henderson, (A3)	200
Heron, (A2)	150
Highwood, (F3)	270
Hilger, (G3)	160
Hingham, (F2)	154
Hinsdale, (K2)	400


MONTANA
SCALE OF MILES
0 10 20 30 40 50 60
State Capital
County Seats
Railroads
National Parks
Size of type indicates relative importance of places
Hammond's 8 x 11 Map of Montana
Copyright, by C. S. Hammond & Co., N.Y.
BRITISH COLUMBIA
ALBERTA
IDAHO
GLACIER NATIONAL PARK
YELLOWSTONE NATIONAL PARK
LINCOLN
FLATHEAD
SANDERS
LAKE
MINERAL
MISSOULA
POWELL
GLACIER
TOOLE
PONDERA
TETON
CHOUTEAU
LEWIS AND CLARK
CASCADE
MEAGHER
BROADWATER
JEFFERSON
GRANITE
RAVALLI
DEER LODGE
SILVER BOW
BEAVERHEAD
MADISON
GALLATIN
PARK
HILL
JUDITH BASIN
BITTER ROOT MOUNTAINS
ROCKY MOUNTAINS
CONTINENTAL DIVIDE
Helena
Great Falls
Butte
Missoula
Kalispell
Anaconda
Bozeman
Lethbridge
Longitude
116° 115° 114° 113° 112° 111°
49° 48° 47° 46° 45° 44°
A B C D E F
1 2 3 4 5 6 7


G
109°
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46°
45°
44°
SASKATCHEWAN
Gouverneur
Shaunavon
Val Marie
Assiniboia
Bengough
Forward
Weyburn
Radville
Neptune
Palisade
Frenchman
Cr.
NORTH DAKOTA
S. DAK.
DANIELS
SHERIDAN
VALLEY
PHILLIPS
BLAINE
ROOSEVELT
RICHLAND
McCONE
GARFIELD
DAWSON
WIBAUX
FERGUS
PETROLEUM
MUSSELSHELL
GOLDEN VALLEY
ROSEBUD
TREASURE
PRAIRIE
CUSTER
FALLON
CARTER
POWDER RIVER
BIG HORN
YELLOWSTONE
STILLWATER
CARBON
WYOMING
Havre
Chinook
Zurich
Harlem
Lost Lake
Turner
Hogeland
Caldwell
Lowrane
Greve
Whitewater
Walsh
Loring
Valleytown
Saco
Hinsdale
Malta
Wagner
Dodson
Phillips
Content
Sun Prairie
Regina
Zortman
Landusky
Hays
Lloyd
Cleveland
Leroy
Barnard
Thoeny
Roanwood
Richland
Opheim
Tobison
Genevieve
Baylor
Avondale
Wendell
Glentana
Battleson
Whitetail
Scobey
Madoc
Flaxville
Navajo
Redstone
Outlook
Daleview
Raymond
Dooley
Comertown
McElroy
Westby
Coalridge
Plentywood
Antelope
Medicine Lake
Reserve
Homestead
Froid
Culbertson
McCabe
Bainville
Mondak
Wolf Point
Poplar
Frazer
Oswego
Nashua
Glasgow
Tampico
Vandalia
Wolf Creek
West Fork
Ossette
Cuskerton
Vohl
Benrud
Bredette
Nickwall
Nina
Riverside
Terrace
Prairie Elk
Vida
Sand Creek
Kellogg
Axtell
Paxton
Circle
Redwater
Brockway
Union
Watkins
Paris
Weldon
Horse Creek
Hay Coulee
Haxby
Eight Point
Randolph
Phon
Butte Creek
Hazny
Jordan
Brusett
Van Norman
Kepler ville
Freedom
Edwards
Sand Springs
Cohagen
Garfield
Mecaba
Dilo
Bruce
Benzien
Lindall
Mosby
Weede
Alice
Snowbelt
Brunelda
Hilliade
Crowley
Wason Flats
Hazel
De Grand
Crow Rock
Fairview
Sidney
Girard
Three Buttes
Newlon Jct.
Lambert
Enid
Savage
Sioux Pass
Andes
Mona
Elmdale
Richey
Sullivan
Rose Valley
Bloomfield
Mink
Glendive
Lindsay
Intake
Stipek
Woodrow
Been
Wibaux
Allard
Hodges
Marsh
St. Phillip
Edgehill
Carlyle
Terry
Fallon
Whitney
Mildred
Cabin Creek
Ismay
Westmore
Plevna
Baker
Ollie
Willard
Calumet
Webster
Knowlton
Mizpah
Miles City
Horton
Hathaway
Kinsey
Shirley
Sutherland
Meredith
Saugus
Hillcrest
Rock Springs
Angela
Maudlin
East Fork
Elmer
Vanstel
Ingomar
Sumatra
Hibbard
Isabell
Vananda
Cartersville
Thurlow
Calabar
Forsyth
Rosebud
Myers
Hysham
Sanders
Bigborn
Custer
Waco
Pompeys Pillar
Newton
Wanetta
Lewistown
Glengarry
Moore
Straw
Natal
Pine Grove
Flat Willow
Battrick
Winnett
Jitney
Smith
Kelley
Grass Range
Roy
Winifred
Suffolk
Christina
Hilger
Auburn
Welter
Blakeslee
Staff
Cat Creek
Valentine
Little Crooked
Joslin
Musselshell
Delphia
Gage
Melstone
Roundup
Elso
Bundy
Pineview
Wheaton
Emory
Darrel
Clara
Ryegate
Belmont
Broadview
Comanche
Acton
Billings
Huntley
Ballantine
Corinth
Toluca
Hardin
Foster
McRae
Dunmore
Crow Agency
Lame Deer
Busby
Ashland
Birney
Kirby
St. Xavier
Lodgegrass
Littlehorn
Wyola
Aberdeen
Decker
Pryor
Fromberg
Bridger
Roberts
Roscoe
Luther
Red Lodge
Bear Creek
Belfry
Warren
Columbus
Park City
Laurel
Absarokee
Rapelje
Reed Pt.
Big Timber
Greycliffe
Castle Rock
Lee
Brandenberg
Stacey
Loesch
Kingsley
Coalwood
Olive
Epsie
Broadus
Selway
Pinto
Graham
Otter
Moorhead
Kruger
Biddle
Volborg
Garland
Beebe
Ekalaka
Mill Iron
Elgin
Chalk Buttes
Ridgway
Arp
Capitol
Boyes
Piniele
Albion
Alzada
Ridge
Knobs
Powder
Tongue
Yellowstone
Missouri
Milk
Musselshell
Big Horn
Frannie
Clark
Cody
Basin
Adobe
Sheridan
Clearmont
Arvada
Buffalo
Gillette
Moorcroft
Sundance
Aladdin
Cambria
Newcastle
Shoshone R.
Shell Cr.
Grey Bull
Crazy Woman
Little Missouri R.
Belle Fourche
Cheyenne
G
from
109° Green-
H
wich
108°
J
107°
K
106
L
105°
M

MONTANA - Cont'd.

Hobson, (G4)	400
Hoffman, (F5)	100
Hogan, (D3)	100
Hot Springs, (B3)	300
Huntley, (H5)	250
Hysham, (J4)	360
Ingomar, (J4)	280
Inverness, (F2)	175
Iron Mountain, (A3)	310
Ismay, (M4)	344
Jardine, (F5)	110
Jefferson City, (D4)	100
Jennings, (A2)	100
Joliet, (G5)	440
Joplin, (F2)	480
Jordan, (J3)	195
Judith Gap, (F4)	522
Kalispell, (B2)	5,147
Kendall, (G3)	300
Lambert, (M3)	287
Lame Deer, (K5)	1,550
Laurel, (H5)	2,239
Laurin, (E5)	100
Lavina, H4)	290
Lewistown, (G3)	6,120
Libby, (A2)	1,522
Lima, (D6)	476
Livingston, (F5)	6,311
Logan, (E5)	250
Lolo, (B4)	150
Lothrop, (B4)	250
Maiden, (G2)	100
Malta, (J2)	1,427
Manhattan, (E5)	591
Martinsdale, (F4)	150
Marysville, (D4)	400
Medicine Lake, (M2)	292
Melrose, (D5)	200
Melstone, (J4)	477
Miles City, (L4)	7,937
Missoula, (C4)	12,668
Moccasin, (G3)	200
Monarch, (F3)	150
Mondak, (N2)	400
Moore, (G4)	355
Musselshell, (H4)	150
Nashua, (K2)	272
Neihart, (F4)	749
Noxon, (A3)	100
Oswego, (L2)	220
Outlook, (M2)	295
Ovando, (D3)	150
Paradise, (B3)	250
Park City, (H5)	400
Philipsburg, (C4)	1,724
Piper, (G3)	150
Plains, (B3)	452
Plentywood, (M2)	838
Plevna, (M4)	241
Polson, (B3)	1,132
Pony, (D5)	242
Poplar, (L2)	1,152
Radersburg, (E4)	370
Rancher, (J4)	130
Red Lodge, (G5)	4,515
Redstone, (L2)	210
Reedpoint, (G5)	260
Rimini, (D4)	100
Roberts, (G5)	220
Rocker, (D4)	100
Ronan, (C3)	600
Rosebud, (K4)	250
Roundup, (H4)	2,434
Roy, (H3)	270
Ruby, (E5)	200
Ryegate, (G4)	405
Saco, (J2)	425
Saint Ignatius, (C3)	300
Saint Peter, (E3)	380
Saint Regis, (A3)	350
Salesville, (E5)	150
Saltese, (A3)	350
Sandcoulee, (E3)	1,000
Scobey, (L2)	1,170
Shelby, (E2)	537
Sheridan, (D5)	538
Shirley, (L4)	100
Sidney, (M3)	1,400
Silesia, (H5)	110
Silverbow, (D5)	100
Simms, (E3)	210
Somers, (B2)	750
Southern Cross, (C4)	150
Square Butte, (F3)	160
Stacey, (K5,	130
Stanford, (F3)	300
Stevensville, (C4)	744
Stockett, (E3)	1,100
Sun River, (E3)	150
Superior, (B3)	150
Sweetgrass, (E2)	350
Taft, (A3)	100
Terry, (L4)	794
Thompson Falls, (A3)	508
Three Forks, (E5)	1,071
Toston, (E4)	159
Townsend, (E4)	897
Trident, (E5)	150
Trout Creek, (A3)	250
Troy, (A2)	763
Twin Bridges, (D5)	755
Two Dot, (F4)	200
Valier, (D2)	613
Victor, (B4)	374
Virginia City, (E5)	342
Walkerville, (D4)	2,391
Warmsprings, (D4)	100
Washoe, (G5)	300
Westby, (M2)	253
Whitefish, (B2)	2,867
Whitehall, (E5)	629
White Sulphur Springs, (E4)	574
Wibaux, (M3)	611
Wickes, (D4)	200
Willow Creek, (E5)	200
Wilsall, (F5)	600
Windham, (F3)	100
Winifred, (G3)	262
Winnett, (H3)	316
Winston, (E4)	150
Wisdom, (C5)	250
Wolf Point, (L2)	2,098
Worden, (H5)	210
Zortman, (H3)	350
Zurich, (H2)	220

rent, Grinnell, Sexton, Blackfeet and Red Eagle glaciers, and from Cleveland, Merritt, Wilbur, Gould, Piegan, Going-to-the-Sun, Citadel and Red Eagle mountains, and the adjacent region in Glacier National Park, on to the Arctic Ocean. The sources of these two rivers are in the wildest and most picturesque region of the State. By the plans of the Federal government much of the water of the Saint Mary will be diverted by canal to the Milk River, and used in the vast system of irrigation for the northern part of the State. Triple Divide Peak (8,001) claims the proud distinction of sending its waters to three oceans. By far the greater portion of the State is in the Missouri River drainage system. The Madison, Gallatin and Jefferson rivers gather the waters from the many small ranges adjacent to the Yellowstone Park and unite at Three-Forks to form the Missouri. Near the city of Great Falls are the «Falls of the Missouri.» From Fort Benton, a short distance below the Great Falls, the river is navigable to its juncture with the Mississippi. The Yellowstone River rises in Yellowstone Lake in the Yellowstone Park, and after taking its two mighty leaps in the park and flowing through its magnificent gorge, it emerges as a restless river, continuing in swift descent until its waters merge with the muddy Missouri. The Yellowstone is the most rapid navigable stream in the world, but it has long since ceased to be used by boats as a commercial highway. From the north the Missouri receives the waters of the Marias, Teton, Sun and Milk rivers, all of which flow through valleys of great fertility. The scenery along the rivers is varied and exhibits some striking antitheses. The valley of the Bitter Root is one of remarkable beauty. The river, as it winds back and forth like a stream of silver, when viewed from Mount Lolo, Ward's Peak or Saint Mary's in the Bitter-Root Range, is probably equaled in quiet and peaceful grandeur only by the Yellowstone as it flows through Hayden Valley in the Park. The three branches of the Flathead present to the few travelers along their course many gorges and cañons. The South-Fork in one place in the Lewis and Clarke Forest reserve has cut its way through solid rock, making a cañon so narrow that pack horses may be and are forced to leap from brink to brink, while the river seethes and boils many feet below, its ominous roar announcing certain death if the leap is short. The Missouri has made the famous «Gateway of the Mountains,» its splendor first told by Lewis and Clark, and later made famous by the brush of artists. At the city of Great Falls, it hastens its speed before tumbling over the beautiful Black Eagle Falls, spanned by a bridge on the Great Northern Railroad, and does not diminish its speed until the bottom of the Great Falls is reached. The valleys of these rivers and their smaller tributaries make rich farming soil, suitable for grain, vegetables and fruit. The Bitter-Root Valley in the West was settled first, and is a great farming and fruit raising region. The country adjacent to Flathead Lake is thickly settled, and produces abundant harvests without irrigation. The Gallatin Valley has become famous for its bountiful harvests, and the Yellowstone is being largely used for agriculture and fruit. The Musselshell River takes its first waters from the crests of the Crazy, Castle, Little Belt and Big Snowy mountains. It flows eastward, through the central portion of the State, makes an abrupt turn northward, emptying into the Missouri. The Judith takes its rise on the northern slopes of the Little Belt and Big Snowy mountains, flows north and gives its waters to the Missouri. The Milk River heads in the Hudson Bay Divide east of Upper and Lower Saint Mary lakes, turns north into Canada, flows east for over 100 miles, returns to the State for another 200-mile stretch before it reaches the Missouri. The Dearborn, Sun and Teton rivers are short but important streams which head in the main range of the Rockies and flow eastward to the Missouri in the Great Falls Region. They furnish the water for large irrigation systems. The Bighorn River rises far south, in the mountains in middle Wyoming, and flows north into the Yellowstone near Custer. The Little Bighorn is a tributary of the former, famous in history because of the Custer massacre on its banks by the Indians. The Powder River also rises far south in middle Wyoming, flowing north with a tortuous course, emptying into the Yellowstone east of Miles City. The Tongue River heads in northern Wyoming and flows into the Yellowstone at Miles City. There are many smaller streams designated as rivers, of greater or less importance, depending upon their location and usefulness in irrigation. There are several large lakes in the State, and many small ones. In the Glacier Park alone (q.v.) are some 250 lakes, large and small. Other sections have numerous lakes, many of which are unnamed. Flathead Lake, in the western part, is about 30 miles long, has an area of 189 square miles and is 289 feet deep. The size and depth of lakes in Glacier Park are given under that heading. The larger ones are Upper and Lower Saint Mary, Kintla, Logging, Bowman and McDonald. Georgetown Lake, near Philipsburg, has an extreme length of several miles. Hauser Lake, a widening of the Missouri River near Helena, was made by the construction of the Hauser Dam.

Climate and Rainfall.— The climate of the State is exceedingly varied, and is much more salubrious than is generally supposed. West of the main range the winters are mild, the summers and falls are delightful. The rainfall at Missoula and Kalispell averages about 16 inches, while at Culbertson and Glendive in the eastern end the rainfall is about 13 inches. Rain and snow prevail during the spring until early July. July, August and September are largely without rain, although in many places there is no need of irrigation. During the last decade, possibly due to increased irrigation and to the tilling of many millions of acres that formerly were used only for range, the rainfall during summer months has increased. In many sections of the State large crops have been raised without irrigation. It must be remembered, however, that there is no certainty of summer rains, and most lands without irrigation are liable to suffer from drouth. Owing to the different altitudes, snow may fall later in the spring at some places than at others. An area of 40,700 square miles is below 3,000 feet elevation above the sea; this is equivalent to a State the size of Georgia. About 10,200 square miles exceed 8,000 feet altitude. The climate on the Pacific slope is milder and less changeable than that of the Atlantic side. The majority of the areas of high barometer, and accompanying cold, originate in the Arctic Region, and are deflected southward or eastward by the Rocky Mountains. While eastern Montana and the Dakotas may be in the throes of a blizzard the western end may be enjoying balmy weather. As in any extreme northern state, the thermometer occasionally records a low midwinter temperature, but the cold spells are short. While they remain there is practically no wind. The air is dry and the sunshine clear. Ordinary outdoor occupations may be carried on with little inconvenience. Summer temperatures are not oppressive, and heat prostrations are unknown. In 1916 Missoula, on the west side of the range, had maximum temperature of 98° F., minimum — 17° F.; east of the mountains Havre, from which the climate of Montana seems to be determined, because it is the first weather bureau station in the United States to record advancing cold waves, had maximum 92° F., and minimum — 33° F. These are merely typical of the greatly varying temperatures. The mean temperature in the western end is 44° F. At Helena, altitude 4,500, the mean temperature is 43°. Chinook winds may occur over the entire State, melting large quantities of snow in a short period of time. Owing to the usual absence of a high percentage of humidity, the cold weather is not extremely disagreeable, nor the warm days smotheringly oppressive. The hot days may blister the skin, while the nights following will be cool enough to require blankets. Rarely does one sleep without considerable covering, and some people wear the same clothing summer and winter, donning extra coats or wraps in winter. This may be given as the general summary: the springs are rainy; the summers are clear and dry; the autumns are delightful; the winters are clear and bracing. Owing to the absence of high humidity the climate is very beneficial to health, as statistics will show. It is especially beneficial to those affected with pulmonary diseases. Malaria is entirely absent. The central Weather Bureau Station is located at Helena. There are stations at Kalispell, Havre and Miles City.

Agriculture and Husbandry.— In the early days of Montana's history it was not thought possible to grow crops in the State to much extent. Nearly everything was shipped in from the outside. As the mines developed the demand for food became so great as to stimulate agriculture, and fruit raising was also attempted. Marked success attended the efforts, and large acreages of grain and orchards were put out annually until agriculture and husbandry have developed in rank above the mineral wealth. In 1902, nearly 250,000 fruit trees were set out; the number was almost doubled the next year. At the close of the year 1903 nearly 1,500,000 fruit trees had been set out in various parts of the State. Since then the acreage has been very greatly increased. The trees in the orchards include apples, cherries, plums, apricots and peaches. Small fruit, such as gooseberries strawberries, blackberries, currants and the like, produce enormous crops from small acreage, while to describe the size and weight of the fruit is almost beyond belief. Apples are shipped to all parts of the country and to Europe. As they are quite free from insect pests, owing to the stringent legislation and watchful care in orchard inspection, home-grown apples are always in demand, the demand being far in excess of the supply. The Bitter-Root Valley, in the western part of the State on the Pacific slope, is the oldest orchard section, and has become famous as a fruit-growing valley. But the orchards are not confined to this beautiful and fertile valley. The valley to the north of Flathead Lake is filled with orchards, already breaking beneath their loads of fruit. The Yellowstone Valley is developing rapidly as a fruit-growing region, even growing grapes. The most recent observations show that fruit trees may be grown and that apples will mature in every portion of the State. Since the portion of the State east of the Rocky Mountains is much greater than on the west the fruit-growing possibilities of the State may be readily understood when it is known that the great majority of the fruit trees of the State are on the Pacific side. About 4,000,000 acres of the 94,000,000 acres of the State were in crops in 1919. This does not include pasture. In the last 10 years the State has had such a large increase of farmers that no safe comparisons with former periods can be made. Great stretches of former prairie land that was given over to grazing and stock raising have been taken by homesteaders, and used for farming purposes. The former prairie wilderness has become a settled country, with farmhouses, schoolhouses, towns, and even cities of good size. The total acreage in farms in 1900 was almost 85 times that reported in 1870, and the increase since 1900 has been tremendous. In the extreme eastern part are the «Bad Lands,» a continuation of the «Bad Lands» of the Dakotas, Wyoming and Nebraska, practically non-irrigable because of the uneven surface. The Yellowstone Valley has become famous for its growth of alfalfa. Two or three cuttings, a total of four to seven tons per acre, are had. The Gallatin, Madison and Jefferson valleys in the southeast produce rich harvests of cereals, never failing through irrigation. In the west the Bitter-Root, Missoula and Flathead valleys, while less extensive, produce as abundant harvests, often without irrigation. The lands are of three general classes — the bottom lands, near the streams, with rich, black, alluvial soil; the bench lands, whose soil is a sandy loam, capable of wide range of cultivation; and the high, bluffs, suitable largely for grazing. The crops in 1922 were, wheat, 40,370,000 bushels; oats, 19,200,000 bushels; rye, 1,827,000 bushels; barley, 1,923,000 bushels; flaxseed, 889,000 bushels; great quantities of corn, hay and forage, potatoes, peas and vegetables. During the past few years, many small fruit and truck farms have been started, promising greater returns per acre and greater variety of farm products, as ready market awaits all kinds of farm products. Montana leads the Union in the number of sheep, there being more than 2,315,000 in 1923. The sheep industry has proven profitable in the eastern portion where there is much open range. In 1923 there were 1,400,000 cattle and 643,000 horses, the assessed valuation of the former being about $47,237,000, and of the latter $24,434,000. Since 1910 the increase has been enormous.

Forests and Lumber.— Twenty-nine per cent of the total area of the State is covered with timber, which is 8 per cent less than for the average of the entire United States. The timber growth is largely of coniferous trees, yellow pine, tamarack and Douglas spruce (red fir), comprising the most of the commercial product. Along the streams occur forests of cottonwood. In the drier portions of the State, stunted red cedars often grow along the smaller water courses, of great value to settlers, as they supply posts and wood. Forests of white cedar or arbor-vitae, white pine and Engelmann's spruce occur in the western part. On the higher slopes and summits the alpine species thrive; but as they have limbs to the base of the tree and inaccessible, they are not of value commercially. They are useful in preventing the rapid melting of the snow in the spring, holding it until later in the season when it is needed in irrigation. A considerable portion of the State's timbered area is included in government forest reserves. The area embraced in each is as follows:

FOREST	National forest land	Other lands	Total
	Acres	*Acres*	*Acres*
Absaroka	842,467	145,243	987,710
Beartooth	662,537	19,393	681,930
Beaverhead	1,337,223	27,777	1,365,000
Bitter Root	1,047,012	108,856	1,155,868
Blackfeet	865,077	202,013	1,067,090
Cabinet	830,676	195,874	1,026,550
Custer	428,922	83,888	512,810
Deerlodge	833,178	130,822	964,000
Flathead	1,802,905	285,815	2,088,720
Gallatin	564,855	344,575	909,430
Helena	687,983	232,497	920,480
Jefferson	1,039,766	135,919	1,175,685
Kootenay	1,336,061	287,279	1,623,340
Lewis and Clark	811,161	15,199	826,360
Lolo	850,677	330,341	1,181,018
Madison	958,691	77,169	1,035,860
Missoula	1,031,529	336,662	1,368,191
Sioux	96,743	17,798	114,541
Total	16,027,463	2,977,120	19,004,583

The annual output of lumber from Montana mills is quite large. The cut for 1920 was considerably above the average for the 10-year period, 1909 to 1919, and also higher than the 1919 cut. The total lumber cut for 1920, based upon mills cutting 50,000 feet board measure or more per year, was 410,000,000 feet board measure. A conservative estimate of the total cut for 1916 was in round numbers at least 385,000,000 feet board measure. The lumber production by species for 1919 (latest census year) is shown below:

	Feet board measure
Yellow pine	108,548,000
Douglas fir	40,675,000
White pine	46,000
Larch	101,714,000
Spruce	34,064,000
Cedar	1,076,000
White fir	1,110,000
Lodgepole pine	95,000
Cottonwood	50,000
Total reported	287,378,000

In addition to the lumber produced in 1919 there were 21,362,000 pieces of lath and 253,000 shingles. Figuring that 7,000 lath is equal to 1,000 feet board measure and that 10,000 shingles is equal to 1,000 feet board measure of lumber, the lath and shingles produced are equal in round numbers to approximately 3,145,000 feet board measure. The total forest products exceeds these amounts by millions of feet. In 1916 there were 138 saw mills in the State, 153 in 1919. The annual increment of all timber lands in the State and the annual cut are approximately equal at present. Under proper management, Montana has sufficient timber land to supply the present annual consumption of the State indefinitely with a surplus for disposal elsewhere. It is roughly figured that western Montana forests, if properly protected and managed, will sustain an annual cut, under present conditions, of about 700,000,000 feet of sawtimber, as compared to a cut at present of about 400,000,000 feet. The entire State will probably sustain a cut of 900,000,000 feet annually. The United States Forest Service is the only organization in Montana growing and planting forest trees for timber production. A nursery, perhaps the largest evergreen nursery in the United States, is maintained at Haugan, Mont., along the foothills of the Bitter-Root Mountains in the extreme western portion of the State. With the exception of the war years, in which shipments were curtailed, the annual production of two and three-year-old forest trees has been approximately 4,000,000 annually, thus making it necessary to keep a stock on hand of trees of all ages of approximately 12,000,000. These trees are field planted on burned-over areas, not capable of restocking naturally, in the White Pine belt of western Montana and northern Idaho. About two-thirds of the output of the nursery is planted in Idaho and one-third, or approximately 1,300,000, are planted in western Montana. Forest fires in the State of Montana during the 10-year period 1908–17 inclusive have caused a damage of approximately $6,500,000. For suppressing the 5,833 fires, which caused this damage, the State of Montana, the United States Forest Service and private agencies have spent about $1,170,000. By far the greatest damage was done in 1910 when the fires escaped from control and destroyed nearly $6,000,000 worth of standing timber and other property. The largest expenditure for suppression was in 1917 when a little over half a million dollars was spent in controlling nearly 1,400 fires. The result of this expenditure is shown in greatly reduced damage. Only about 16.2 per cent of the fires are caused by lightning, which is the only natural cause of any consequence. Railroads cause 37.2 per cent; campers, 17.2 per cent; brushburning, 10.2 per cent; incendiaries, 4.3 per cent; lumbering, 0.9 per cent; miscellaneous causes, 2.3 per cent, and 11.7 per cent are from unknown causes. Prior to December 1908 the Forest Service was administered from Washington, with inspection districts in charge of inspectors throughout the West, each containing a number of national forests. In December 1908 the headquarters of District No. 1 was established at Missoula. The organization of the district office consists of a district forester with four assistants. These heads of administrative offices have each a corps of assistants. The total number of people employed in the district office is approximately 80. In addition to the timber resources of the national forests of Montana, they yield each year an abundant crop of forage for the production of livestock. In any fiscal year, cattle and horses to the number of 200,000 and 800,000 sheep and goats graze on the national forests of Montana, mainly during the summer period, and yield a revenue to the United States of approximately $150,000. The revenue, however, represents merely a nominal charge for the forage used. The true commercial value would perhaps reach approximately $500,000 annually.

Mines and Mining.— In the early years of the State's history Montana was known principally on account of her mines. Although mining has taken second place to agriculture the State is still a mining section, with vast expenditure and enormous returns. A thousand million dollars worth of precious and semi-precious metals is a fair estimate of the mineral products, extending over half a century. The early history is the search for gold, and many of her towns and cities are built in gulches where placer gold was mined. Helena and Virginia City are illustrations, the latter being the oldest camp in the State. Although Butte is the greatest mining camp in the State, and indeed the greatest in the world, there are many other places where mining is carried on. Gold was discovered in Montana in paying quantities in 1862. The find was in Grasshopper Creek, where later the town of Bannock was built, and where the first seat of government was established in 1864. The diggings of Alder Gulch and Last Chance Gulch, where Helena now stands, followed. It is estimated that in the first 20 years of placer mining $200,000,000 in gold was taken, although no accurate system of determining is possible. Montana Bar in Confederate Gulch, Broadwater County, yielded $1,600,000. This was packed in kegs, hauled in freight wagons to Fort Benton and taken thence by boat to Sioux City, the nearest railroad. The men of the Lewis and Clark Expedition probably stirred big values in gold, unknowingly, as they laboriously poled and dragged their boats up the Missouri past this bar. The true source of the gold found in the placer mines is yet a mystery. Following the discovery of free gold came gold quartz mining. The first mine was the Ore Cache at Summit in Alder Gulch. Other discoveries were made rapidly. In the 60's every reef and outcrop in Madison County was staked and recorded. Then came the attempt to mine and smelt silver-lead ores. Long before a railroad reached the State lead-silver bullion was shipped to Crinne, Utah, in freight wagons, for smelting. Copper ore of value was not discovered in Butte until about 1880. Ore was found in seemingly inexhaustible quantities. Smelting works were erected, big plants being constructed. In later years zinc deposits have been developed and an electrolytic zinc-reducing plant has been constructed at Great Falls. Manganese ores, which have heretofore been of a negligible quantity, have been found in the Butte mines. The Philipsburg region is also rich in manganese. The high price for this ore on account of the war caused great activity in manganese production in 1917 and 1918. Other mineral producing regions are Jardine, Park County, which produces gold, silver, selenite and tungsten; Emigrant Gulch, placer gold; Hell Gate, copper ore; Radersburg, gold and other ores; Silver Camp, at the headwaters of the Big Blackfoot, silver, copper and zinc; Elkhorn, in Beaverhead County, several ores; Neihart, Cascade County, silver-lead ore; Castle, Meagher County, lead; mines near Helena, gold. The total value of all minerals produced in 1914 was about $47,800,000. In 1915 the output was almost doubled, reaching $87,000,000. In 1916 this was again almost doubled, $145,300,000. Production in 1917 and 1918 was still enormously increased. The output of the different counties is given for the year 1916 (a representative year) with totals for the year 1922.

COUNTY	†Gold, fine, ounces	†Silver, fine, ounces	Copper, pounds	Lead, pounds	Recoverable zinc content, pounds	Total value
Beaverhead	273.37	90,616	226,132	785,308	....	$175,091
Broadwater	3,990.50	7,223	700,542	46,480	....	262,784
Cascade	316.02	98,651	3,916	635,169	19,106	118,795
Deer Lodge	35,848.54	36,155	163,949	50,593	18,754	811,180
Fergus	20,931.23	13,920	8,280	93,351	....	450,324
Gallatin	....	2	1,486	....	....	367
Granite	6,482.35	649,328	493,349	75,709	89,063	699,782
Jefferson	4,857.43	164,703	852,857	679,760	898,348	585,872
Lewis and Clark	36,673.76	101,635	33,102	92,285	43,318	815,306
Lincoln	447.23	303	594	10,500	....	10,314
Madison	39,678.63	43,915	116,744	383,557	....	904,310
Meagher	2.95	282	236,545	....	....	58,437
Mineral	589.21	76,411	380,565	1,309,188	3,116,812	664,251
Missoula	338.92	946	41,321	....	....	17,794
Park	33.23	616	....	6,086	....	1,512
Phillips	19,946.90	175,907	....	....	....	528,086
Powell	1,631.16	13,730	27,957	86,083	....	55,570
Ravalli	981.67	27,924	16,038	62,620	488,532	112,396
Sanders	26.66	8,328	86,498	83,365	....	33,062
Silver Bow	47,071.39	14,983,771	349,538,498	9,195,082	224,585,142	127,547,714
Total, 1916	220,130.15	16,494,366	352,928,373	13,595,136	229,359,072	*$133,882,947
Total, 1922	73,100.00	12,500,000	165,100,000	29,775,000	114,000,000	44,483,000

* Average value of metals: Gold, $20.6718 per ounce; silver, $0.658 per ounce; copper, $0.246 per pound; lead, $0.069 per pound; zinc, $0.134 per pound.

† Includes placer production.

State Capitol at Helena

Montana is one of the richest coal States in the West, although much of it is undeveloped. The cretaceous, bituminous and semi-bituminous coal areas in the State cover about 13,000 square miles, and the lignite area about 25,000. Not all of this territory contains coal, of course, but the deposits are found quite abundantly throughout the State. The quality varies from anthracite to low grade lignite. Anthracite is present, but not in commercial quantity. The inferior lignite is in the Great Plains section. The grade of coal improves as the mountains are approached, culminating, usually, in highest grade in or near the mountains. Tests show the bituminous coal to be little inferior to Pennsylvania bituminous coals. Lignite is not yet extensively used because methods of making briquettes are as yet commercially expensive, and without briquette moisture and gas rapidly leave the coal. But lignite is a natural resource with great future value. One lignite bed near Miles City is 40 feet thick. Over 1,810,000 tons of coal were mined in the State in 1910. In 1916 the output was 3,700,000 tons; in 1922, 2,400,000 tons. New mines are being opened annually. Bituminous coal or lignite has been found in nearly every county in the State. The undeveloped coal industry will, without doubt, be a prominent factor in the future expansion of other industries of the State. In addition to its coal, the State has extensive beds of clay, of different grades and qualities. Stones for building purposes are quarried in many sections. Montana leads the States of the Union in the production of sapphires, the actual mining of which began in 1891. Four mining regions may be mentioned: A belt 12 miles northeast of Helena on the Missouri River; the Rock Creek region, 30 miles west of Anaconda; the Cottonwood Creek fields, 10 miles east of Deer Lodge, and the Yago mines in Fergus County, 13 miles west of Utica. The last in the most productive region. In recent years both oil and gas have been found in the State. Oil was first discovered in the Elk Basin, Carbon County, near the Wyoming line, 11 Nov. 1915. Since then seven Montana wells are producing in this district. The first well was sunk to a depth of 1,494 feet, with a production during the first 24 hours of 150 barrels. The flow continued about 200 barrels daily after the first day. In October 1917 two oil prospects were discovered near Laurel in Yellowstone County. Exploratory work is conducted in the Dry Creek Basin in Carbon County, near Bridger and Laurel in Yellowstone, in Toole and Sweet Grass counties, in Musselshell County, near Lavina and Roundup, in Deer Lodge, Lewis and Clark, Cascade and Dawson counties. The Montana oil wells marketed in 1922, 2,369,000 barrels. Gas has been discovered in the northern, the central, the southern and eastern parts of the State. A number of gas wells near Havre were bought in in 1915, with a supply more than ample to heat the city. A fine deposit of gas has been found near Baker and the gas has been piped to the town for use. About 70 miles from Billings, near the State line, a well was blown in in 1916 with a flow of 100,000,000 cubic feet of gas every 24 hours and was extremely difficult to plug and control.

Manufactures.— The predominating industry is the smelting of ores. The largest smelter of the world, the Washoe, is located at Anaconda. For the treatment of ores water is brought from Silver Lake, some 15 miles away, in the mountains. Ores from Butte and elsewhere are treated at the Washoe. The ores are transported by an electrically operated railroad 28 miles in length. The smelter reduces about one-fourth of the copper mined in the United States. In connection with the smelter is a large sulphuric acid plant. Another great smelter is built on the sloping bank of the Missouri River at Great Falls, securing an abundance of water from the river. The third great smelter of the State is at East Helena. In 1919 about $11,000,000 worth of lumber was cut by the mills of the State. The larger mills are located at Hamilton, Missoula, Bonner, Saint Regis, Somers, Eureka and Libby. At most of these places there are, in connection with the mills, factories for the manufacture of sash, doors, windows and various forms of cases and cabinet work. Considerable furniture is made from native lumber. Large flour mills have been built in practically every section of the State. With the increase in grain growing in the State the manufacturing of flour and cereal products has in very recent years made great advancement. In 1919 the flour production was 1,271,861 barrels. Much of this went outside of the State. The manufacture of beet-sugar was first started at Billings, where the large factory produces as high as 35,000 tons a year. The byproducts of the factory are of great commercial importance. A beet-sugar factory has been erected at Missoula and others are being planned for various places in the State. Creameries have been built in nearly every valley, and with many of these a cheese factory is associated. Flax fibre mills have been built in the eastern part of the State, where flax is extensively raised. Nearly every large town had a factory for the brewing of beer but as the State went dry 1 Jan. 1918, this ceased to be an industry. In a number of cities meat packing is an industry, but small as compared with the big houses. Although the State leads in wool production it is shipped East for cleaning and carding. Brick, tile and some kinds of pottery are made quite extensively in places, and there are many remarkable clay beds unused. A cement factory is located at Trident. The State's population is yet small, but has grown very rapidly in the last 10 years. Manufacture has in that time increased enormously. The great natural resources of the State will make it in the years to come a great manufacturing region.

Railroads.— There are three transcontinental systems crossing the State from east to west, the Great Northern, Northern Pacific and Chicago, Milwaukee and Saint Paul, with many branch lines. It is the only Rocky Mountain State to be crossed by three transcontinental lines. These roads traverse some of the most beautiful and picturesque portions of the State, giving travelers an idea of the scenic beauty of plains, rivers and mountains. The long distance across the State from east to west by the Northern Pacific is 806 miles. The Oregon Short Line connects the States to the south with these main trunk lines. It terminates at Butte. The Burlington enters the State south of Billings, giving a short route to all points toward the southeast. The Great Northern and Northern Pacific operate nearly 4,600 miles of track in the State, including sidings, spurs and sidetracks. The Chicago, Milwaukee and Saint Paul operates by electricity all its trains from Harlowtown, Mont., to Avery, Idaho, a distance of 450 miles. Powerful electric locomotives requiring neither coal nor water, and making no smoke nor cinders, draw the heavy trains over the Rocky Mountains. The engines are so constructed that on down grade electricity is generated, the current thus produced being transmitted to the feed wire. This electrical generation acts as a brake. It requires 24 hours or more to go the entire length of the State by rail. The Northern Pacific follows the Yellowstone River from Glendive to Livingston. At this place a branch line goes to Yellowstone Park. At and near Bozeman the road crosses the famous Gallatin Valley. It then follows the Missouri River to Townsend, where the ascent to the main range of the Rockies really begins. In the western part of the State it follows the beautiful scenic shore of Clark's Fork of the Columbia. The Great Northern follows the Missouri for a long distance after it enters the State, and then along the Milk River for several hundred miles. Continuing westward across beautiful prairie country to the Rockies it crosses to the Pacific side, giving superb view of some of the beautiful peaks in Glacier Park. Near the western border it follows the Kootenay River with majestic mountains on either side. The Milwaukee enters from Dakota in the eastern prairie region, crosses the Yellowstone River at Terry, follows this river about 75 miles to Forsyth, continuing westward from here to the Musselshell River, and further west to the Three Forks of the Missouri. Here the ascent of the main range begins. On the west the road traverses the Bitter-Root Mountains, over a pass with beautiful view in every direction, and down hill to Spokane. During the past few years not much construction has been undertaken, although prior to that many hundred miles were built in a short time. In 1917 and 1918 more than 100 miles of new road were built and put in operation. The rapid development of the State agriculturally has made great demand for railroad construction. In 1923 the State had 6,914 miles of steam and 856 miles of electric railways.

Finances.— Revenue in year 1921–22, $13,934,763; expenditures, $13,862,056; balance 1 July 1922, $3,134,012. Budget for 1922–23 contemplated receipts, $14,500,000; expenditures, $14,000,000. Bonded debt $4,598,000; floating $3,274,370, total, $7,872,370. Assessed real property 1922, $1,165,214,526; personal, $417,142,150.

Politics.— Montana was admitted as a Republican State 8 Nov. 1889. It was organized as a Territory in 1864. Owing to the silver question its politics were for a time very undecided. In 1896 the State was overwhelmingly for free silver. In 1900 the fusion of Democrats, Laborites and Socialists carried almost everything. In 1902 a Republican was elected to Congress. In 1912 the Progressive party carried the State, which went for Wilson in 1916. The State has two Congressional districts, and is represented in Congress by two congressmen and two senators. In 1916 Montana elected the first woman to Congress, Miss Jeannette Rankin, a graduate of the State University in her home town, Missoula.

State Government.— The Constitutional Convention met at Helena 4 July 1889, concluding its labors 19 August. The constitution was approved by the people at a special election in October, and the proclamation making Montana a State was issued 8 November. Women are now possessed of the full franchise and may vote at all elections and hold office. Women have filled every position for county superintendent of schools. The office of State superintendent of public instruction is filled by a woman. Women are elected to different county offices. Two women sat in the State legislature in 1917. The governor and State officers hold office four years, elected by a plurality vote. The Territorial and State governors and their terms of office are as follows:

TERRITORIAL.

Sidney Edgerton	22 June 1864, to	12 July 1866
Thomas F. Meagher, Acting	1865 to 1866	
Green Clay Smith	13 July 1866, to	9 April 1869
James M. Ashley	9 April 1869, to	12 July 1870
Benjamin F. Potts	13 July 1870, to	14 Jan. 1883
J. Schuyler Crosby	15 Jan. 1883, to	15 Dec. 1884
B. Plat Carpenter	16 Dec. 1884, to	13 July 1885
Samuel T. Hauser	14 July 1885, to	7 Feb. 1887
Preston H. Leslie	8 Feb. 1887, to	8 April 1889
Benjamin F. White	9 April 1889, to	8 Nov. 1889

STATE.

Joseph K. Toole, Democrat	8 Nov. 1889, to	2 Jan. 1893
John E. Rickards, Republican	2 Jan. 1893, to	4 Jan. 1897
Robert E. Smith, Democrat and Populist	4 Jan. 1897, to	4 Jan. 1901
Joseph K. Toole, Democrat and Populist	4 Jan. 1901, to	1 April 1908
Edwin L. Norris, Democrat	1 April 1908, to	— Jan. 1913
Samuel V. Stewart, Dem.	Jan. 1913, to	Jan. 1921
Joseph M. Dixon, Rep.	Jan. 1921 —	

The governor is a member of the State board of prison commissioners, State board of examiners, State board of land commissioners, State board of equalization, State board of education, State board of commissioners for the insane, State board of commissioners for the deaf, dumb and blind, State board of horticulture, State board of farmers' institutes, State board of livestock commissioners. By and with the advice and consent of the State senate he appoints the members of the various boards where the law does not particularly specify. He appoints the State land agent, the register of lands, the veterinarian, the forester, the engineer, the commissioner of labor and industry, the dairy commissioner, the recorder of marks and brands, the mine inspectors and some other appointive officers. The legislature has biennial sessions in odd-numbered years. The State senate is composed of one member from each county. The State house of representatives has such apportionment as is made by the legislature. There are 54 in the senate, four years, one-half holding over, and 107 in the house, making a total legislative assembly of 161. The State has two representatives in Congress from two districts. There are three judges of the State Supreme Court, for a term of six years. There are 18 judicial districts, the judges elected for four years. The term of county commissioners is four years, each county having three members. State officials are elected for four years, county officials, except commissioners, for two years.

Banks and Banking.— At the close of the fiscal year ending 30 June 1917, Montana led the nation in the number of new national banks chartered during the year. Thirty new banks brought the total of national banks to nearly 100. There were in 1922, 131 national and 268 State banks and 7 private banks. The total capitalization of banks is about $13,000,000; loans and bonds, $90,000,000; total assets, 15 Sept. 1922, $95,094,000.

Education.—Although young among the States, Montana ranks high in the efficiency of her educational system. When Montana was admitted to the Union the common schools received as an endowment from the national government one-eighteenth of all the public land in the State. When fully completed by survey and selection of lien lands the total will be approximately 5,234,000 acres. Up to 1918 the total sales of 794,914 acres netted the common school fund $14,539,887. More than one-third of this is invested in bonds, warrants, and farm loans, bearing interest. Nearly $8,000,000 is represented by deferred payments, drawing 5 per cent interest. The State treasurer has $1,247,576 in cash awaiting investment. The total income from this source in 1917 was $877,536, a total of $5.50 per capita for school children. Land grants to the State institutions for higher learning aggregate 668,080 acres, much of which has been sold. The fund accumulating from sales is loaned at interest. In 1922 there were 100,274 children enrolled in the schools of the State, an increase in 10 years of over 60 per cent. In the same year there were 4,989 teachers, an increase in 10 years of 200 per cent. The greatest increase in teachers and children was in the northeastern part, where heavy immigration had taken place. Summer school attendance of all Montana teachers in 1918 was 1,227. The average salary of superintendents and principals in the county-seats was $2,282.67. All of the county superintendents in the State are women. All but five county superintendents have supervision of territories larger than Rhode Island, and six county superintendents have counties to travel that are larger than Delaware and Rhode Island together. The public schools of the State are under the supervision of the State department of public instruction. Under the State superintendent there is a deputy, and two rural school inspectors. The legislature in 1918 made provision for an inspection of high schools. The control of the higher State institutions is in the hands of the State board of education. This board consists of the governor, the attorney-general and the State superintendent of public instruction, ex-officio members, and seven other members appointed by the governor. The University of Montana, composed of its four schools, as well as the State School for Deaf, Dumb and Feeble-Minded, at Boulder; the State Industrial School, at Miles City, and the State Orphans' Home, at Twin Bridges, all come under the jurisdiction of the State board. Each of these institutions has a local administrative board to carry on its work, and the four schools composing the University of Montana have, in addition to the local board, a chancellor of the university, located at Helena, whose duty it is to correlate and unify the work. The State has a system of county high schools, under a separate board of trustees and with separate administration from city schools. These schools are maintained by county assessment, and are free to pupils in the county. The law was passed in 1898. Eighteen counties in the State have county high schools. For these schools, expensive and lasting buildings are constructed. The State Normal School at Dillon has 1,431 in attendance. The State Agricultural College and experiment station at Bozeman (1892) has about 1,000 students. The State School of Mines (1889) is at Butte, with about 140 students. The State University (1895), at Missoula, has about 1,354 students. The university established a summer school for science at Flathead Lake in 1899, known as the University of Montana Biological Station. It has continued in successful operation since, and has drawn many from the State and from Eastern States. The Montana Wesleyan College (Methodist) is at Helena. The College of Montana (Presbyterian) was for years the only institution for higher education in the State. Financial difficulties caused its suspension about 1898. The Billings Polytechnic Institute is at Billings. Many private schools are maintained by the Catholic Church. The Sacred Heart Academy at Missoula has an attendance of several hundred, as have also the academies in Butte and other places. In accordance with an act of the legislature approved 8 March 1915, teachers who have taught 25 years, the last 15 of which have been in Montana, may retire on an annual retirement salary of $600. School officials are required to deduct $1 every month from the salary of every teacher in their employ for the benefit of the retirement salary fund. This applies to all teachers except those actually in the employ of Montana schools at the date of the approval of the act, who were allowed till 1 Jan. 1916 to decide whether to avail themselves of the law or not. There are 18 county high schools. The number of accredited high schools (1918) is, for four years, 55; for three years, 10; for two years, 38; for one year, 18. There are nine academies and private schools accredited for four years. The number of county libraries (1918) is four; high schools with normal training courses, 11; school nurses in city schools, 11.

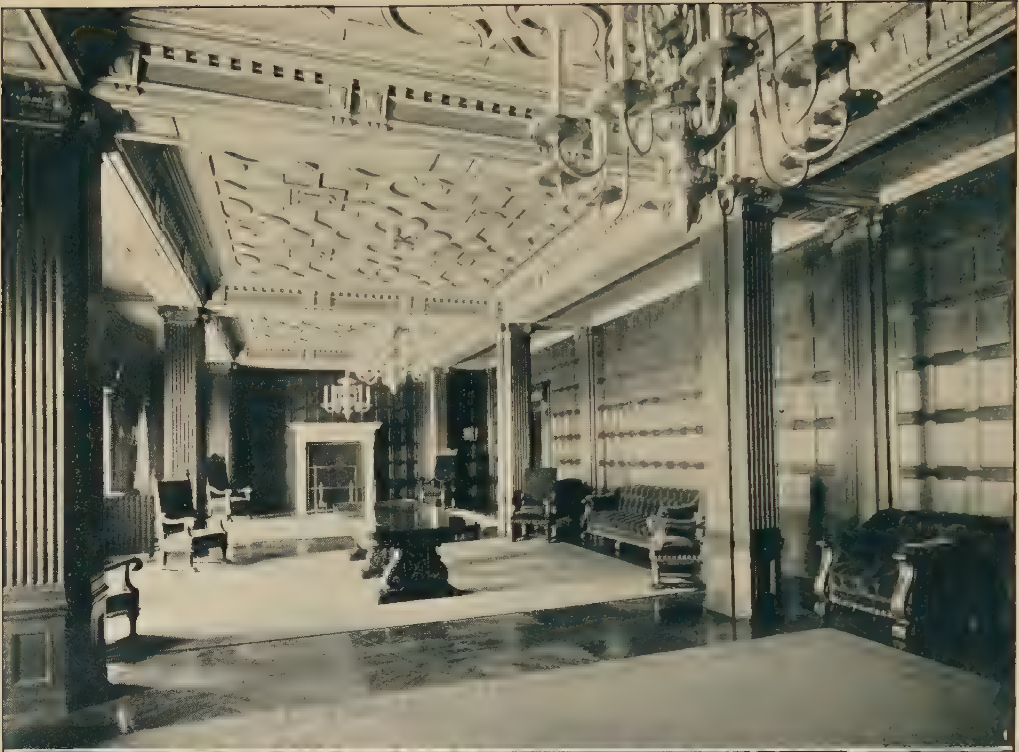
Charitable and Penal Institutions.— The penitentiary is located at Deer Lodge. Convicts are given outdoor work on the public highways in different parts of the State, on parole. The system gives highest satisfaction both to the inmates and to the guards. It is no uncommon sight to see from 50 to 100 convicts at work, absolutely unguarded. Of the inmates a small proportion is native born, the remainder being from other States. Many criminals flee to the mountains, and Montana undoubtedly helps care for the criminal population of many other States. Charities and reform are placed in the hands of a board of three members, appointed by the governor for four years. The reform school for boys is located at Miles City. The school for deaf, dumb and blind, and for delinquents, is located at Boulder. The soldiers' home is at Columbia Falls. The asylum for the insane is at Warm Springs. A sanatorium for tuberculosis patients with capacity for 80, is located at Galen near Deer Lodge.

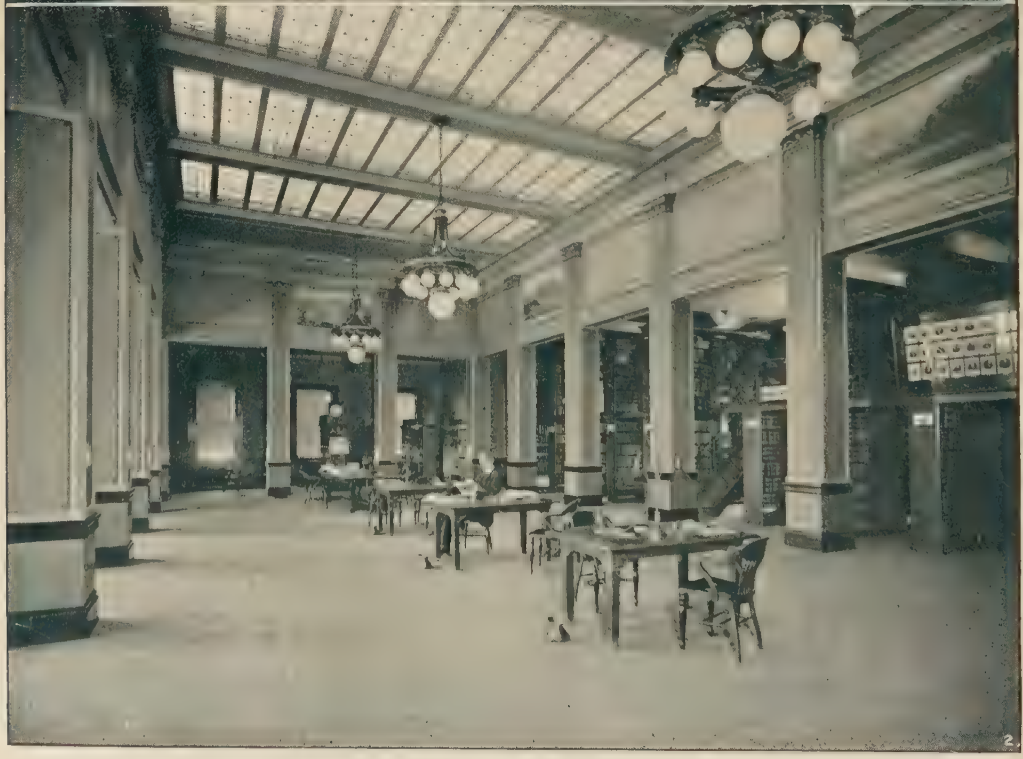
Government Reservations.— Notwithstanding the large area of the State much of it is set apart by act of Congress as reserves. The Glacier National Park includes 915,000 acres, or about 1,450 square miles. The forest reserves, with about 16,000,000 acres, or nearly 15,000 square miles, are mentioned elsewhere. In the early days the Northern Pacific Railway Company received a grant from Congress of every other section for a distance of 50 miles on either side of the railroad, approximating 15,000,000 acres in Montana, or nearly one-sixth of the area. Of this amount much has been sold. Approximately 3,500,000 acres are yet in the hands of the company. There are several large Indian reservations in the State. In recent years the only reservation west of the divide, the former Flathead Reservation, was opened for settlement. Each Indian was given an allotment, and the remainder was opened for settlement, the homesteader paying a stipulated amount per acre. This money was placed in a fund for the Indians. This reservation covered 2,240 square miles, and is now largely in farms. In the northeastern part of the State, with its southern boundary made by the Missouri River, is the former Fort Peck Reservation, comprising 2,775 square miles. This, also, has been been opened to settlers, and has been homesteaded. Four Indian reservations are left: the Crow, in Yellowstone and Custer counties, covering an area of 5,475 square miles, larger than the State of Connecticut; the North Cheyenne, in Rosebud and Bighorn counties, 765 square miles; the Fort Belknap, in Blaine and Phillips counties, 840 square miles; and the Blackfeet, which includes about a third of Teton County, or about 2,000 square miles. The total land now comprised by Indian reservations is about 3,700,000 acres, and about 3,800,000 have been opened for settlement. There are about 300,000 acres in military reservations. The State lands comprise about 3,000,000 acres. The National Bison Range, under the control of the United States Biological Survey, located at Ravalli, a few miles west of Missoula, contains nearly 20,000 acres. In it are buffalo, antelope, elk and deer. The Willow Creek Bird Reservation, about one section, is near Augusta, in Lewis and Clark County, and is for the protection of plover and avocets. The Flathead Lake Bird Reservation consists of two small islands in Flathead Lake.

History.— The first explorations are believed to have been made by Pierre and Chevalier Verendrye, who, with two Canadians and a party of Indians, are supposed to have entered Montana about 1743. The route they took and the points to which they reached are puzzling and the records conflicting. It was at first thought they had gone as far west as the Gate of the Mountains, and is so recorded in the 'Contributions to the Historical Society of Montana.' It seems to be generally agreed by later investigators that the party went only into the southeastern part of the State, and it is doubtful if they came into Montana at all. While in the country of the Choke Cherry Indians they planted on an eminence a leaden plate on which were engraved the arms of France, and erected a monument of stones. In 1913, 170 years later, this leaden plate was found by some school children, but this was in Pierre, S. D., much farther east than had been supposed, as it was supposed to have been buried near the Great Falls of the Missouri. For 50 years the country remained unknown to history. The whole territory was ceded to Spain by France along with Louisiana in 1764. In 1800 the country again passed to France by treaty. In 1803 the Louisiana grant, embracing a large part of what is now Montana, was ceded by France to the United States for a consideration of $15,000,000. The portion of the State west of the Rocky Mountains was embraced in the Territory of Oregon, when Oregon was organized in 1848. In 1863 a new Territory of Idaho was formed, including Montana. In 1864 the Territory of Montana was organized with its boundary the same as that the State now has, except that about 2,000 square miles have been added in the southeast. In 1804 President Jefferson sent an expedition to explore the northwestern territory. The expedition was under the direction of two army captains, Lewis and Clark, and has become famous in history as the Lewis and Clark Expedition (q.v.). They ascended the Missouri, explored some of its tributaries, crossed the range to the Pacific Ocean, and returned in safety to Saint Louis. The first trading post was that of Manuel Lisa, built in 1807 on the Big Horn River. In 1827 another was established on the Missouri at the mouth of the Milk River. In 1829 Alexander Mackenzie, for the American Fur Trader Company, built Fort Union on the Missouri above the mouth of the Yellowstone. In 1832 the steamboat *Yellowstone* ascended to this point. Previous to this all supplies were taken overland, a distance of nearly 2,000 miles. In 1835 a steamboat went 60 miles up the Yellowstone. In 1846 Fort Benton was built. Steamboats ascended the Missouri to the fort in 1860, and the property was turned over to the United States in 1869. On the western side Father DeSmet established Saint Mary's Mission at Stevensville in 1845, still standing in 1919. Later he founded Saint Ignatius' Mission in the valley at the foot of Flathead Lake and in the shadow of the beautiful Mission Mountains, which for 50 years was a great power for good among the Indians. From 1840 to about 1860 the history of Montana is occupied mainly with the missionary labors of Father DeSmet and his associates among the Flathead Indians. About 1855 there were rumors of gold. In 1852 a half-breed named François Finlay, commonly known in Indian as Benetesee, found gold in the sands of Gold Creek in Deer Lodge County. Rich discoveries were found in 1861. In 1862 Grasshopper and White's Bar were discovered, and Bannack in January 1863. Gold dust to the amount of $25,000,000 was taken from Alder Gulch in a few months. Last Chance Gulch, where Helena now stands, produced many fortunes. The early mining was largely from placers, but the introduction of machinery made the treatment of ores of silver, gold and copper very productive, and made the permanent prosperity of Butte. The introduction of so many settlers was not without a struggle. The Indians resisted the advance of the white men. Many minor conflicts occurred, but two are worthy of special mention. The war with the Sioux

1 Senate Chamber, Montana State Capitol

2 House of Representatives, Montana State Capitol





1 Governor's Reception Room, Montana State Capitol

2 Law Library, Montana State Capitol

opened in 1876, and was a desperate conflict. General Custer was dispatched against the Sioux, under the leadership of Sitting Bull, numbering 6,000 warriors. Pushing up the Rosebud to its headwaters Custer found the Indians encamped on the Little Big Horn. Custer was surrounded and his entire command massacred, not a man escaping. Within a year a series of victories under General Miles had destroyed the power of the Indians. In 1877 Chief Joseph, of the Nez Perces in the western part of Idaho and his tribe prepared to cross the Bitter-Root Mountains against the orders of the government. They crossed the mountains and passed up the Bitter Root, pursued by soldiers under the command of General Gibbons. At the Big Horn a bloody and indecisive battle was fought. Chief Joseph passed through, up the Madison, through the Yellowstone National Park, across the prairie to Snake Creek and was captured only a few miles from the Bear Paw Mountains — a trail of over 1,500 miles, more than half of which was a running battle. A convention met in Helena in January 1884 which adopted a State constitution. This was approved by the people in November of the same year. Congress refused to sanction the request for statehood, and this was not granted until 1889. Since then immigration has brought many citizens from other States. The former restless population has changed into people who are desirous of making permanent homes. Agriculture and fruit culture, through irrigation, has added a new industry to the State, and the people of the farm join hands with the toiler beneath the surface in the mines, in an exchange of products, to the advantage of both and for the material advancement of the State.

Population.— The first Territorial census in 1860 shows but 288 people in the Territory, exclusive of Indians. The population as given by the census for each decade is as follows: (1860) 288; (1870) 20,595; (1880) 39,159; (1890) 132,159; (1900) 243,329; (1910) 376,056; (1920 official) 548,889. Illiteracy is low. There are 54 counties in the State, as follows, with their county-seats:

COUNTY	County seat
Beaverhead	Dillon
Big Horn	Hardin
Blaine	Chinook
Broadwater	Townsend
Carbon	Red Lodge
Carter	Ekalaka
Cascade	Great Falls
Chouteau	Fort Benton
Custer	Miles City
Daniels	Scobey
Dawson	Glendive
Deer Lodge	Anaconda
Fallon	Baker
Fergus	Lewistown
Flathead	Kalispell
Gallatin	Bozeman
Garfield*	Jordan
Glacier*	Cutbank
Golden Valley	Ryegate
Granite	Philipsburg
Hill	Havre
Jefferson	Boulder
Judith Basin	Stanford
Lewis and Clark	Helena
Liberty	Chester
Lincoln	Libby
Madison	Virginia City
McCone*	Circle
Meagher	White Sulphur Springs
Mineral	Superior
Missoula	Missoula
Musselshell	Roundup
Park	Livingston
Phillips	Malta
Pondera*	Conrad
Powder River*	Broadus
Powell	Deer Lodge
Prairie	Terry
Ravalli	Hamilton
Richland	Sidney
Roosevelt*	Mondak
Rosebud	Forsythe
Sanders	Thompson Falls
Sheridan	Plentywood
Silver Bow	Butte
Stillwater	Columbus
Sweet Grass	Big Timber
Teton	Choteau
Toole	Shelby
Treasure*	Hysham
Valley	Glasgow
Wheatland	Harlowton
Wibaux	Wibaux
Yellowstone	Billings

* Established by the legislature in 1919.

The following is the population of cities with more than 10,000 population, as given by the 1920 census: Butte, 41,611; Great Falls, 24,121; Missoula, 12,668; Helena, 12,037; Anaconda, 11,668; Billings, 15,100. Cities of over 2,000 population are Glendive, Miles City, Red Lodge, Roundup, Dillon, Deer Lodge, Glasgow, Havre, Kalispell, Whitefish, Bozeman, Livingston, Lewistown, Laurel, Walkerville, Wolf Point. Many important business places have appeared within a few years, as Baker, Hardin, Roundup, Valier, Polson and Hysham. Many small places far inland from railroads do very large business. Butte, the largest city in the State, is situated on the Pacific side of the main range, at an altitude of 5,700 feet, a few miles from the summit of the range. It is noted for the wonderful richness and extent of its mines. It is a railway centre, the transportation facilities making it an important wholesale and distributing point. The State School of Mines is located at Butte. Great Falls, the second city in the State, was located and plotted by Paris Gibson, yet living, and James J. Hill, in 1883, before the coming of the railroad or the building of a house. It is a beautiful city, with parks and boulevarded streets. It is an important commercial centre and the several falls in the river make it a great source of electrical power. A large smelter is located on the bank of the Missouri River. It has many factories and is the centre of a large agricultural country. Missoula, the Garden City, is on the west side of the range, at the mouth of Hell Gate Cañon. It has a large surrounding agricultural, fruit-growing and lumber country. The Milwaukee and Northern Pacific transcontinental roads pass through the city and there are branch roads up the Bitter-Root River, over the Cœur d'Alene Mountains to Idaho and up the Big Blackfoot River. It has a beet sugar factory, erected in 1917, flour mills and other factories and is the seat of the State university. A few miles out is the government army post, Fort Missoula. Helena, the capital of the State, owes its existence to the discovery of gold in Last Chance Gulch. The capitol is a beautiful building, constructed from sandstone from Columbus, costing $1,100,000. The elevation of Helena, 4,700 feet, and its location near the summit of the main range of the Rockies, give it a delightful climate. The Montana Wesleyan and Mount Saint Charles College are located in Helena. The State Fair is held annually near the city. Anaconda, the Smelter City, was founded by Marcus Daly as a suitable place for the erection of smelter works. The Washoe Smelter, employing between 3,000 and 4,000 men, is the largest in the world. Anaconda is on Warm Spring Creek in the Deer Lodge Valley, elevation one mile above sea-level. A State fish hatchery is located in Anaconda. Billings is the largest city in eastern Montana and is in a rich agricultural region, with extensive livestock interests. It has excellent railroad facilities and is a large distributing centre. A large beet sugar factory is located at Billings and near the city is the Billings Polytechnic Institute. Miles City is «the greatest primary horse market» in the world. Bozeman is the home of the State College of Agriculture and Mechanic Arts and of a United States fish hatchery. Livingston is the gateway to the Yellowstone National Park. Red Lodge has great coal mines.

Bibliography.— The following works may be consulted for further information relative to the history and development of the State: Bancroft, ‘History of the Northwest Coast’ (1886); ‘Idaho and Montana’ (1890); Biddle, ‘History of the Expedition under the Command of Lewis and Clark’ (1842); Davies, ‘Civics of Montana’ (1896); Lewis and Clark, ‘Travels from St. Louis by Way of Missouri and Columbia Rivers to the Pacific Ocean’ (1804–06); Palladino, ‘Indians and Whites in the Northwest; or, a History of Catholicity in Montana’ (1895); Roosevelt, ‘Ranch Life and the Hunting Trail’ (1888); ‘Geological Survey of the Territory’; ‘Preliminary Report of Montana and portions of Adjacent Territories’ (1871); Dimsdale, ‘Vigilantes’; Brady, ‘Indian Fights and Fighters’ (2 vols., 1903–07); Chittenden, ‘American Fur Traders of the Far West’; Chittenden, ‘History of Early Steamboat Navigation on the Missouri River’; DeSmet, ‘Western Missions and Missionaries’; Fogarty, ‘The Story of Montana’ (1917); Judson, ‘Montana, the Land of the Shining Mountains’ (1909); Lant, ‘Pathfinders of the Northwest’; Miller, ‘History of Montana’; Sanders, ‘History of Montana’; Shields, ‘The Battle of the Bighole’; Stone, ‘Following Old Trails’ (1913); Swain, ‘Civics for Montana Students’; Wheeler, ‘The Trail of Lewis and Clark’ (1904); *Wonderland,* issued annually by N. P. Railway, Saint Paul; *Rocky Mountain Magazine;* Proceedings of the State Historical Society. Publications from the agricultural experiment station at Bozeman, from the University of Missoula and by the various State officers. Annual report, Bureau of Agriculture, Labor and Industry, Helena.

Morton J. Elrod,
Director of Biological Station, University of Montana.

MONTANA NATIONAL BISON RANGE AND HERD.— The range is in western Montana, along the Northern Pacific Railroad between Ravalli and Dixon. The tract set apart for the home of the herd contains approximately 20,000 acres, with both grazing land and timber. In the centre is a mountain about 2,500 feet high, with grassy slopes and wooded ridges. On the north side of the range several miles of Post Creek are included. On the south side the range takes in about a mile of the Jocko River. In the interior are several large springs. The place is ideal for buffalo. It is estimated the food supply is sufficient for a herd of from 1,500 to 2,500 animals. The range was selected by Prof. M. J. Elrod, of the University of Montana, for the American Bison Society, with W. T. Hornaday, then president. In 1908 Senator Dixon of Montana introduced in Congress a bill to provide for the purchase of the range and for fencing. This became a law in May 1908. The American Bison Society raised a fund of $10,560 for the purchase of bison for the range. Thirty-seven animals made the nucleus of the present herd, about 300 (spring of 1919). In addition, elk, antelope and white-tailed deer have been added since, and are doing well. The selection of the range was a part of the plan of the American Bison Society to save the bison from extinction. Mr. Hornaday expressed the opinion that this herd alone, one of several now in the United States, is sufficient to save the species from becoming extinct. The location is ideal, the surface is sufficiently undulating to afford protection from storms from any direction, there is abundance of bunch grass, it is easy of access and the animals subsist summer and winter upon the vegetation of the range. Consult Report of the American Bison Society (1908) and subsequent reports.

MONTANA STATE SCHOOL OF MINES, made one of the component parts of the University of Montana by act of legislature in 1913, founded in 1899, is located at Butte, the greatest mining centre in the world. Its work is confined exclusively to the preparation of mining engineers. It was endowed by a land grant of 100,000 acres, of which 33,085 acres have been sold, cash and deferred payments amounting to $661,192.93. This amount draws interest. The number of students in 1917 was 88, in 1923, 140. The number of alumni was about 200. There were seven professors, one of whom acted as president. The total value of all property was $640,107. The total income was $98,243. The departments include chemistry, geology, mineralogy, mathematics, mechanics, metallurgy, mining engineering and mining law. The course of instruction covers four years.

MONTANA STATE COLLEGE OF AGRICULTURE AND MECHANIC ARTS, made one of the component parts of the University of Montana in 1913, founded in 1893, is located at Bozeman. It was endowed by a land grant of 140,000 acres, of which 41,543 acres have been sold, the cash and deferred payments amounting to $668,637.50. This draws interest. The number of students in 1917–18 was 789 — 382 men and 407 women; in 1923, 870. Several hundred additional students were enrolled in the short courses for farmers and their wives, and ministers. The total number of instructors, not including Experiment Station workers and members of the extension service, was 153 in 1923. The alumni numbered 353. The State Experiment Station, with its director and staff of workers, is connected with the college. The college receives the benefit of the Federal land grants of 1862 and 1890, and also State and Federal appropriations. The income in 1918 was, for the college, $241,668; for the station, $106,250; for extension service, $93,023. The total endowment fund from land grants amounted to $680,250. The college course is offered under several groups: the College of Agriculture, the College of Engineering, College of Applied Science, College of Household and Industrial Arts, School of Home Economics, School of Agriculture, School of Music and Vocational Education. The degree of Bachelor of Science is given for the completion of the various courses, and graduate work is offered. Short courses are offered in some lines of work. Farmers' Week brings several hundred people for intensive work. Ministers' Week has brought together nearly 50 each year. The buildings are modern and of permanent construction, and include the Main Hall, Hamilton Hall (dormitory for women), Agricultural Hall, Chemistry (new), Drill Hall and Engineering, with many smaller buildings and barns for experimental and laboratory work.

MONTANA STATE NORMAL COLLEGE, The. One of the four components of the University of Montana. The institution is located at Dillon and was created by act of the State legislature in 1892. In March 1913, made effective 1 July 1913, the several higher institutions of the State were constituted the University of Montana. The first chancellor was appointed and assumed his duties on 1 Feb. 1916, on which date the Normal College really became a part of the university through methods of administration. There were 19 members of the faculty on the instructional force. The number of students was 535. The income from all sources in 1918 was $105,600. The land grant of the institution totals 100,000 acres, 33,000 of which have been sold. The proceeds of sales, invested in bonds, amount to $423,625, with deferred payments of $119,599 in 1919. The Shakespeare Club Loan Fund, to aid seniors, the Alumni Loan Fund, to aid seniors, and the S. P. Wells Loan Fund, to aid juniors and seniors, total more than $1,000. For high school graduates two courses of instruction are provided, one two years in length, the other three years in length leading to the degree bachelor of pedagogy. Special courses for the preparation of rural school teachers and for supervision of domestic science, manual training and music in elementary schools are also offered. The public elementary schools of Dillon are utilized as a training school. This training school enrolls 600 pupils.

MONTANA STATE UNIVERSITY, originally the University of Montana, made one of the component parts of the latter by legislative act of 1913, is located at Missoula. It was endowed by a grant of land, 46,560 acres, from Congress in 1892. Of this amount 30,668 acres have been sold, the sales amounting to $539,715. The doors of the institution were opened September 1895 with a few students and six members of the faculty. In February 1923, the faculty included 86 professors, assistant professors and instructors, lecturers and librarians. The total number of students in 1918 was 941,—304 men and 637 women; in 1923, 1,354. The total number of alumni was 488. The income from all sources was $450,000. Courses are offered in the College of Arts and Sciences in biology, botany, chemistry, economics, education, English, fine arts, geology, history and political science, home economics, Latin and Greek, mathematics, modern languages, physics, psychology, public speaking, physical education. There are professional schools in forestry, journalism, law, music and pharmacy. Provision is made for graduate work. A biological station is maintained at Flathead Lake. The work of the university continues throughout the year, on the four-quarter system. The degrees conferred are A.B. and B.S., and the corresponding masters' degrees. Women are admitted on equal terms with men. The income is derived in part from the sale of land, in greater part from legislative appropriation. The campus contains about 50 acres, with an adjoining portion of Mount Sentinel of 560 acres. This beautiful mountain rises from the level plain 3,200 feet high. In 1918 the buildings were main hall, science hall, Craig hall (women's dormitory), library, natural science building (new), gymnasium, two barracks buildings constructed for the Student Army Training Corps, a hospital to care for 50 patients and a Y. M. C. A. hut. Legislative appropriation was made for a new library building. The library contains about 40,000 volumes and 18,000 pamphlets, and receives over 400 periodicals.

MONTANAR, mȯṅ-tä-när, **Valentine Hilaire,** French-American missionary: b. Marignane, France, 14 Feb. 1870. He was educated at the seminaries of Aix, France, and the Paris Seminary for Foreign Missions. In 1889 he joined the Society for Foreign Missions, was ordained priest in 1893 and the same year was sent on the Kwang-tong mission, China. While in that province he was stationed successively at Linchow and San Ning. From 1908 to 1912 he was in New York in charge of the Chinese Catholics of that city and from 1912 to 1915 he was in charge of the Catholics of Chinese birth at Montreal, Canada. He was persecuted during the Boxer uprising in China and saw many of his Christian chapels and villages laid waste. In 1905 he was accused by Chinese officials at San Ning of implication in the massacre that took place there that year. He was exonerated of all blame, however, upon investigation by Mr. Lay, American consul at Canton, and Commander Evans of the United States navy. He compiled a Chinese-French dictionary, for use in the missionary schools conducted by him and is the author of ‘Method of Learning the Cantonese Language’; ‘Fifteen Years in China,’ and contributions to ‘The Catholic Encyclopedia,’ the *Bulletin de Notre Dame de Beauregard*, and various American and French periodicals.

MONTANELLI, mȯṅ'tạ-nĕl'lē, **Giuseppe,** Italian author and patriot: b. Fucecchio, January 1813; d. there, 17 June 1862. He studied law. He became counsel, writing at the same time on philosophical subjects and (1836) issued a volume of lyric poetry. In 1840 he was made professor of Italian and commercial law at Pisa. He founded the Society of Fratelli Italiani (1844), started (1847) the periodical *L'Italia*, fought at Curtatone (1848) and was made (1849) a member of the triumvirate with Guerrazzi and Mazzini. He was given a mission in

Paris, from whence he issued a series of works of a striking character such as ‹Memorie sull' Italia e specialmente sulla Toscana dal 1814–1850› (Turin 1853–55); ‹La sensazione› (Paris 1856), a dramatic poem; ‹Camma,› a gripping tragedy; also the political works, ‹Il partito nazionale italiano› (Turin 1856); ‹L'impero, il papato, la democrazia in Italia› (Florence 1859). In 1859 he was again called to arms and (1862) was elected to Parliament. Consult Provenzal, ‹Alla cara memoria di Guiseppe Montanelli› (Leghorn 1862); Redi, Ricardo, ‹Biografico di Giuseppe Montanelli› (Florence 1883); Orlando, ‹Il Montanelli poeto,› in *Marzocco* (ib. 1910).

MONTANISM, mon′-, the religious system of Montanus (q.v.).

MONTANITE, a mineral consisting of the hydrated oxides of bismuth and tellurium, and having the formula $Bi_2O_3.TeO_2.2H_2O$. It occurs as an incrustation, frequently in connection with the mineral teradymite, from which it is often formed by alteration. It is soft and opaque with a waxy lustre, and is variable in color. Montanite is found at Highland, Mont., and also in Davidson County, N. C., and at Norongo, N. S. W.

MONTANUS, mŏn-tā′nŭs, Phrygian sectary of the middle of the 2d century A.D. Of him practically nothing is known save in connection with his sect, the Montanists. He was a heathen priest, a native of Ardahan; was converted to Christianity about 156; and about 171 A.D., proclaimed himself the Paraclete or Comforter promised by Jesus. He soon gathered around him a group of followers who believed with him that he was the mouthpiece of the Holy Spirit, as were his companions Prisca, or Priscilla, and Maximilla, each of whom had left her husband to join Montanus. Both these women uttered prophecies, but like Montanus claimed to be only the passive agents of the Holy Ghost. Montanus' principal tenets, apart from his belief that every believer may be the means of special revelation, were largely millenarian; in view of the approaching end of the world he enjoined asceticism, strict church discipline with the exclusion of all offending members, the terrible effect of mortal sin and the incompetency of the Church to forgive it. He and his followers counted it sin to attempt escape from persecution. He was excommunicated with his followers about 175, and died soon after; Maximilla, the last of the prophets, died in 179. His teaching spread after his death, his most notable disciple being Tertullian (q.v.). The sect soon died out in the West, but survived in the East until the time of Justinian, when it was suppressed. Consult Bonwetsch, ‹Geschichte des Montanismus› (1881); Erlangen, De Loyres F., ‹Montanism and the Primitive Church› (Cambridge 1878).

MONTARGIS, môṅ-tär-zhē, France, a town in the department of Loiret, 47 miles east by north of Orleans. It is a manufacturing town with an important trade in paper, cotton goods, leather, shoes, chemicals and agricultural produce. Mirabeau was a native; the castle anciently a favorite residence of the reigning family was called «The Royal Cradle,» and here in 1371 occurred the famous judicial combat between the «dog of Montargis» and Macaire, its master's murderer. The dog not only showed the spot in the forest of Bondy where its dead master was buried, but singled out the murderer, and when Charles VI granted the ordeal of battle to test his guilt, the dog flew at his throat and so proved its charge upon his body. Pop. 13,000.

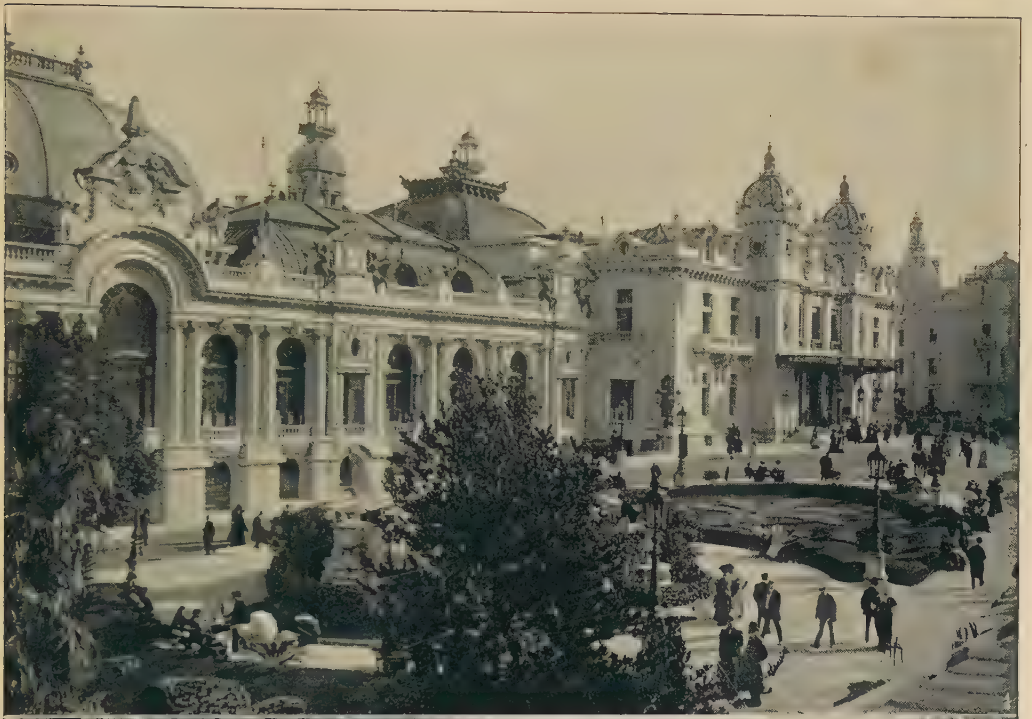
MONTAUBAN, môṅ-tō-bōṅ, France, capital of the department of Tarn and Garonne, on the Tarn, 342 miles south by west of Paris. It is situated on a plateau surrounded by the Tarn, the Tescou and a deep ravine. The cathedral, episcopal palace, hôtel de ville and the bridge over the Tarn are its principal features. Montauban has manufactures of silk bolting cloths, of common cloths, colors, porcelain, starch, candles, etc.; silk and wool spinning-mills, dyeworks, potteries, etc. During the religious wars in France, Montauban was a stronghold of the Huguenots, and was besieged in 1580 by Montluc, and in 1621 by the troops of Louis XIII, without success; but it was taken in 1629 by Richelieu, and its walls razed to the ground. The Protestants maintain both an academy and a theological college. The artist Ingres was born at Montauban; many of his pictures are in the museum and his celebrated ‹Vow of Louis XIII› hangs in the cathedral. Pop. 30,000.

MONTAUK INDIANS, an American tribe of the Algonquin family formerly occupying the extreme eastern end of Long Island, N. Y. They were formerly a powerful people, but a pestilence in the 17th century reduced their number to less than 1,000. Since 1903 only about a dozen of the Montauk tribe survive on Long Island.

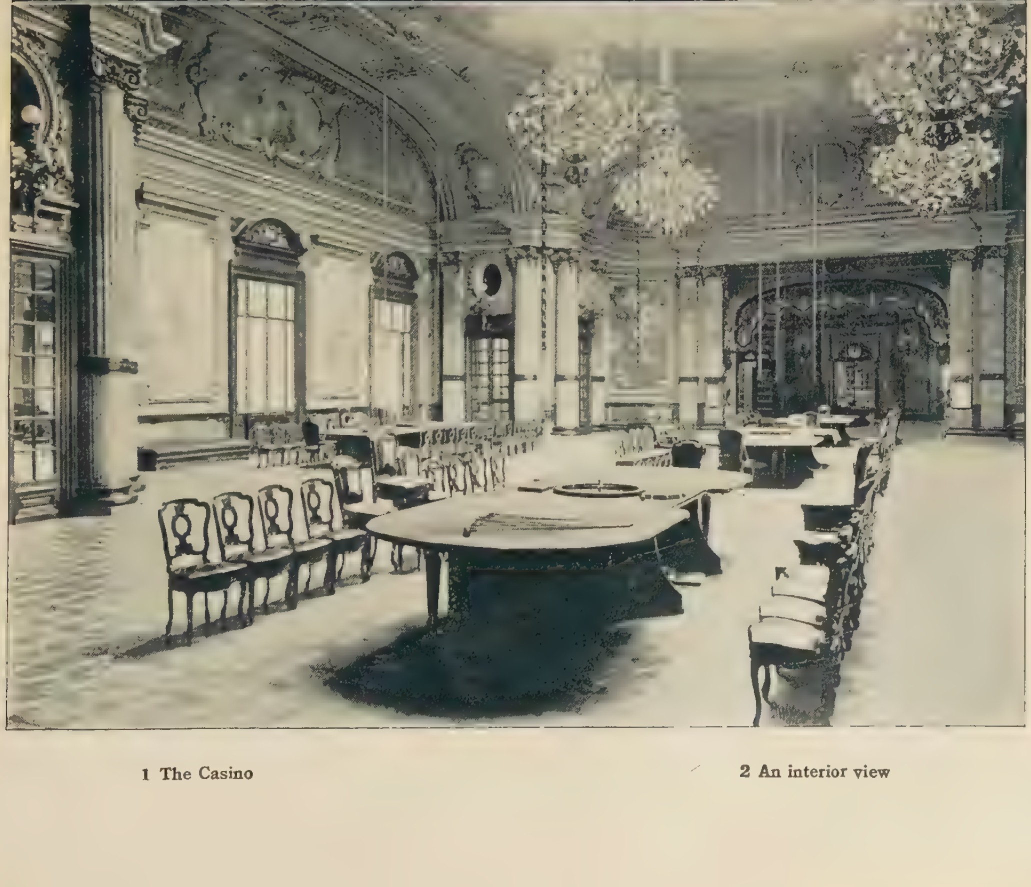
MONTAUK POINT, N. Y., the eastern peninsular promontory of Long Island, in Suffolk County, with lighthouse and life-saving stations, the lighthouse, in long. 41° 4′ N.; lat. 71° 51′ W., being built of stone, 170 feet high, and its light visible 19 miles. The peninsula has a height of from 50 to 100 feet above the sea, is rolling and wooded and noted for its bracing healthful climate. Here in 1898 Camp Wikoff was established for the sick, wounded and convalescent soldiers who had served in the Spanish-American War.

MONTAUSIER, mŏṅ′tō′zyā, **Charles de Sainte-Maure,** MARQUIS DE, French diplomat: b. 6 Oct. 1610; d. 17 May 1690. He entered the army young, distinguished himself in Italy and Lorraine and in his 28th year became major-general. After seceding from the Reformed Church and subscribing to the Catholic faith (1645) he was created lieutenant-general and governor of Saintonge and Angoumois. He remained true to the court during the Fronde war and, in 1665, he was raised to marquis and peer, being appointed guardian of the Dauphin in 1668. In 1680 he was made chief chamberlain. Under his supervision Bossuet and Huet edited the classical writers in *Usum Delphini.* He was distinguished for strict morality and love of the truth, in fact his character was inclined to be sombre, from which fact he was used by Molière as the original Misanthrope. He married Julie Lucine d'Angennes, daughter of Marquis de Rambouillet, a lady of great beauty and whose talents made their home the centre of the most noted sages

MONTE CARLO



1 The Casino



2 An interior view

and artists of the day. Consult Roux, A., ‘Montausier, sa vie et son temps’ (Paris 1860).

MONTBÉLIARD, môṅ'bā'lyär, France, capital town and fortress in the department Doubs, located on the Allaine, into which the Lisaine discharges at this point. It is on the Rhine-Rhone Canal and on the Lyons Railway and has a lofty castle dating from the 15th and 16th centuries, a Protestant church (Saint Martin's), erected 17th century, and a modern Catholic church. There are monuments to Cuvier, who was born here, and Denfert-Rochereau, also a natural history and an archæological museum, a college, trade school, library, Chambers of Agriculture and Trade, also manufactures of hardware, clocks, tools, cotton goods. Considerable trade is done in building lumber and cheese. It was formerly the capital of the dukedom of Burgundy, becoming the domain of Würtemberg (1397) by marriage but was repeatedly occupied by the French (1674–97 and 1723–48), becoming French territory (1801) by the Treaty of Lunéville. Pop. (1911) 10,392, mostly Protestants.

MONTCALM, mŏnt-käm' (Fr. môṅ-kälm), **Louis Joseph de Saint Véran,** loo-ē zhō-zĕf dė säṅ vā-räṅ, MARQUIS DE, French soldier: b. near Nimes, 1712; d. Quebec, Canada, 14 Sept. 1759. He entered the army at 14, distinguished himself in the war for the Austrian Succession and gained the rank of colonel in the battle of Piacenza, Italy, in 1746. In 1756, being then a brigadier-general, he was appointed to command the French troops in Canada, where he began operations against the English with great activity and success. Fort Ontario at Oswego was carried on 14 Aug. 1756, after a well-conducted attack. The next year he took Fort William Henry, at the head of Lake George, which was held by a garrison of over 2,500 men, and thus became possessed of 42 guns and large stores of ammunition and provisions. In the campaign of 1758 he occupied the strong position of Fort Carillon (Ticonderoga), made it still stronger by entrenchments, and on 8 July held it with 3,600 men against a British force of over 15,000. His personal bravery had gained him great popularity among his soldiers, but the want of energy on the part of the home government, the scarcity of food all over New France and personal dissensions between himself and the civil governor forbade him to look for much assistance; and he expressed his conviction that in a few months the English would be masters of the French colonies in America; yet he prepared as best he could for the campaign of 1759. The English had sent strong reinforcements and were preparing for an attack on Quebec. As the success of the whole campaign and indeed the conquest of Canada depended upon the taking of that city, Montcalm had concentrated his principal forces on the banks of the Montmorency River to protect it. In the first attack, 31 July, the English general, Wolfe, was repulsed; he later succeeded in landing his troops above Quebec, and on 13 September brought his whole force to the Heights of Abraham; Montcalm at once opposed his advance, but though he led the attack in person, his troops soon broke before the fire of the British. Wolfe fell in the moment of triumph; Montcalm was mortally wounded and died the next morning. Consult Bonnechose, ‘Montcalm et la Canada Française’ (1877); Parkman, ‘Wolfe and Montcalm’ (1885); Falcairolle, ‘Montcalm devant la Postérité’ (1886); Doughty, ‘The Siege of Quebec and the Battle of the Plains of Abraham’ (1901).

MONTCEAU-LES-MINES, môṅ'sō-lā-mēn', France, town in the department Saône-et-Loire, on the Canal du Centre and the Lyons Railway. It is the centre of coal mining, lime-burning and copper foundries and has wooden-ware factories. Pop. (1911) 26,830.

MONTCHRESTIEN, môṅ'krā'tyăṅ', **Antoine de,** French dramatic author: b. Falaise, about 1575; d. near Tourailles, 1621. Having killed his adversary in a duel he had to flee to England but was pardoned by Henry IV and was killed in a Huguenot uprising. Of his tragedies worth notice are ‘Sophonisbe’ (1594); ‘Aman’ (1599); ‘L'Écossaise, ou Marie Stuart’ (1601). He was also the first to give a conception of political economy in his ‘Traité d'économie politique’ (1615; new ed. by Funck-Brentano, Paris 1889). Consult Duval, ‘Mémoire sur Antoine de Montchrestien’ (Paris 1868); Funck-Brentano, ‘Montchrestien, sa vie et son œuvre’ (ib. 1889); Julleville, Louis Petit de, ‘Les tragédies de Montchrestien’ (ib. 1891); Lavalley, Paul, ‘L'œuvre économique d'Antoine de Montchrestien’ (Caen 1903).

MONTCLAIR, mŏnt-klār', N. J., a town in Essex County, five miles northwest of Newark, on the Lackawanna and Erie railroads. The upper portion was originally called Speertown when settled by Hollanders from Hackensack, and the lower portion was first called Cranetown, then West Bloomfield, by its English settlers from Newark. It was at first included in Newark, and afterward in Bloomfield. It received its present name in 1865 and received its charter of incorporation in 1868. Montclair is situated on the first range of the Orange Mountains, at an average altitude of 300 feet, its highest point at 650 feet embracing an extensive view. It is noted for its healthful climate, and is principally a residential place, the home of many New York business men. It has a hospital, military academy, two orphan asylums, high schools, public library, national and State and savings banks. Its industrial establishments include electric construction works, printing establishments, etc. Pop. 28,810.

MONT-DE-MARSAN, town, capital department Landes, France, 65 miles south of Bordeaux. It has a mineral spring, manufactures of resin and oil, and a trade in lumber, wine and cattle. Pop. 12,000.

MONTE, Saint Angelo, môṅ'tā sänt än'jā-lō, Italy, town in the province of Foggia, located on the southern slope of Monte Gargano near the Gulf of Manfredonia. Its noted 11th century grotto church dedicated to Saint Michael is much visited by pilgrims. The inhabitants of the entire commune were 23,012 in 1911.

MONTE CARLO, mŏn'tē kär'lō, Monaco, a town of the principality about one mile northeast of the capital, celebrated for its Casino, the most luxuriously appointed gambling establishment in the world, founded in 1858. Monte Carlo is also noted for its scenic surroundings, its mild and healthful climate and its attractive appointments of perfect roads, magnificent gardens, handsome promenades and elegant residences. Its situation on an isolated elevation overlooking a bay of the Mediterranean is particularly beautiful. The «Association of the Watering-Place and Strangers Club of Monaco,» with a capital of $6,000,000 in 60,000 shares, holds the contract, which was made with the late M. François Blanc to expire in 1913, whereby the reigning prince was paid annually the sum of $350,000 for the concession to play. The society in 1898 was granted an extended concession to 1947, for a cumulative decennial increase in its annual payment; it practically bears also the cost of the temporal and spiritual government of the principality, its annual expenditure alone amounting to over $4,000,000. Roulette and trente et quarante are the principal games played. Pop. 10,000. See MONACO.

MONTE-CASINO. See CASINO, MONTE.

MONTE CRISTO, mŏn'tĕ krēs'to, or krĭs'tō, a small island in the Mediterranean belonging to the Italian province of Leghorn, 28 miles south of Elba. In the 16th century it was ravaged by pirates, and as it is rocky and barren, rising 2,000 feet above the sea, it long remained uninhabited. Since 1874 there is a penal agricultural colony here. The elder Dumas gave the name of this isle as title of the hero of one of his most popular romances, ‹The Count of Monte Cristo.›

MONTE ROSA, rō'sä, on the Italian-Switzerland boundary, is an Alpine mountain mass of the Pennine ridge, with numerous peaks, eight of which are over 13,000 feet high. Dufour Spitze, the principal peak, is second to Mont Blanc as the highest peak of the Alps, reaching an altitude of 15,217 feet, 564 feet less than its rival, 50 miles to the southwest. Monte Rosa is covered on all sides with glaciers, chief of which is the Gorner Glacier on the west, six and one-half miles long. The peak was first ascended — a most difficult feat — in 1855. Copper and iron mines are worked in the mountain.

MONTE SAN GIULIANO, mȯṅ'tā sạn joo-lyä'nō, Italy, town in the Sicilian province of Trapani and located 2,540 feet above sea-level on an isolated mountain, the Eryx of the ancients. Remains of the old Phœnician walls still exist and a few remnants of the ancient temple of Aphrodite as well as the cistern (Venus spring). It has a 14th century church and a castle affording a magnificent panoramic view. Its industrial life consists of olive culture and marble quarries. In 1911 it had 28,663 inhabitants.

MONTEBELLO, mȯṅ'tā-bĕl'lō, Italy, village in the province of Pavia, situated on the Coppa. It is noted through two battles fought here. The first occurred 9 June 1800, and is frequently called the battle of Casteggio, in which General Lannes defeated the Austrians thereby gaining the title Duke of Montebello. The second, fought 20 May 1859, was won by the French under Forey, while the Austrians were commanded by Stadion. Pop. 2,183.

MONTECUCULI, mŏn-tĕ-koo-lē, or **MONTECUCOLI, Raimondo,** Austrian military commander: b. near Modena, 21 Feb. 1609; d. Linz, 16 Oct. 1680. He entered the Austrian service and served during the Thirty Years' War with great distinction. After the Peace of Westphalia (1648) he visited Sweden and England in a diplomatic capacity; and in 1657 the emperor sent him to the aid of the king of Poland against Rakoczy and the Swedes, and next year he assisted the Danes against the latter. In 1664 he gained a great victory over the Turks after having driven them out of Transylvania. In 1673 he was placed at the head of the imperial troops and checked the progress of Louis XIV by the capture of Bonn and by forming a junction with the Prince of Orange in spite of Turenne and Condé. Montecuculi's subsequent advance into Alsace was repulsed by the Prince of Condé. His last military exploit was the siege of Philipsburg. The Emperor Leopold made him a prince of the empire and the king of Naples gave him the duchy of Melfi. His memoir on the Turkish war, written in Italian (1703), was translated into several languages. Consult Campori, ‹Raimondo Montecucoli, la sua famiglia e i suoi tempi› (Florence 1877); Grossmann, ‹Raimund Montecucoli› (Vienna 1878).

MONTEFIASCONE, mȯṅ'tā-fyạs-kō'nā, Italy, town in the province of Rome and circuit of Viterbo, situated on a hill to the southwest of Lake Bolsena and on the Attigliano-Viterbo Railway. It is the seat of a bishopric and has among its most prominent buildings a beautiful cathedral, a Romanesque church (San Flaviano), a 16th century castle, etc. The muscatel wine cultivated here is known as «Est, Est, Est,» which has some connection with the grave inscription here dedicated to the Canon John von Fugger. Its population in 1911 was 9,563 for the commune. Consult Buti, L. Pieri, ‹Storia della città di Montefiascone› (Montefiascone 1870).

MONTEFIORE, mŏn-tĕ-fē-ō'rĕ, **Claude Joseph Goldsmid,** English author and Jewish communal worker: b. London, 1858. He studied at Balliol College, Oxford; identified himself with Hebrew charities and educational movements in London; was president of the Jewish Historical Society (1899–1900); and is head of the Anglo-Jewish Association, the Jews' Infant Schools, etc. With Israel Abrahams he edited *The Jewish Quarterly Review* and wrote a series of sermons, ‹Aspects of Judaism› (1895). He has published besides the Hibbert Lectures for 1892, ‹The Origin of Religion, Illustrated by the Ancient Hebrews›; ‹Liberal Judaism› (1903); ‹The Synoptic Gospels› (1909); ‹Some Elements of the Religious Teachings of Jesus› (Jowett Lectures, 1910).

MONTEFIORE, SIR **Moses Hayim,** Jewish philanthropist: b. Leghorn, Italy, 24 Oct. 1784; d. Ramsgate, England, 28 July 1885. He was descended from a family of wealthy Anglo-Italian bankers; was educated in London; became a leading member of the Stock Exchange; and retired from active business in 1824. From that time he devoted himself to the service of his race, working for the removal of disabilities and oppression under which the Jews in England and elsewhere had suffered great hardship. His wife, whom he married in 1812, was Judith Cohen, a relative of the Rothschilds, and in her Montefiore found a companion who entered ardently into his philanthropic undertakings. He was for a time high sheriff of Kent, and after long exclusion and repeated

Moses Montefiore Bart

re-election was legally recognized as sheriff of London in 1837. In that year he was knighted and in 1846 raised to a baronetcy in recognition of his meritorious public services. He distinguished himself by his practical sympathy for his race in various countries, chiefly in Poland, Russia, Rumania and Damascus. He made seven journeys to the East, the first in 1827, and the last in 1874, mainly for the amelioration of the condition of the Jews. At Bucharest during an anti-Jewish tumult, he boldly faced the mob at the risk of his life. In 1865 he endowed a Jewish college in memory of his wife, who died three years before, at Ramsgate, where he passed the last years of his life, dying there in his 101st year. In his 100th year he was a type of hale and venerable manhood.

MONTEGO BAY, West Indies, harbor on the north coast of the island of Jamaica. It contains a teachers' seminary, hospital, etc., and has a considerable export trade in fruits and other produce. It is the seat of an American consular station and had 6,616 inhabitants in 1911.

MONTELEONE DI CALABRIA, mȯṅ'-tā-lā-ō'nā dē kạ-lä'brē-ạ, Italy, capital of a circuit in the province of Catanizara, near the Gulf of Sant Eufemia and located on the Naples-Reggio Railway. It contains the ruins of the castle built by Frederick II, and also of the 15th century San Michele Church, besides a lyceum and grammar school. Its commerce consists chiefly of silk and oil production. The town was utterly destroyed by earthquake in 1783, and again much injured in 1905. In 1911 it had 13,066 inhabitants. Consult Pignatari, ‘Sunto di notizie storiche intorno alla città di Monteleone’ (Monteleone 1896).

MONTÉLIMAR, mȯṅ'tā'lē'mär, France, capital town of the arrondissement in department Drôme, located at the juncture of the rivers Roubion and Jahron on the Mediterranean Railway. It contains an ancient castle, now a prison, with a Romanesque chapel, a college, library, museum, Chamber of Agriculture, etc. Among its manufactures are hats, silks, paper goods, agricultural instruments and its noted almond candy (nougat). It has also considerable trade in silk, wine, truffles, lime, etc. The town receives its name from Adémar de Monteil who rebuilt it after its destruction, in the 10th century, by the Saracens. In the 15th century the town fell into the possession of the French Crown. It withstood the siege of Coligny heroically in 1570 but was taken by the Huguenots in 1587.

MONTEMAYOR, mōn-tā-mă'yōr, **Montemor Jorge,** Spanish-Portuguese poet and novelist: b. about 1520; d. 1561. His real name was Montemôr, but it assumed the Spanish form Montemayor in Spain. There is little definitely known of the life of Montemayor. He was one of the poet musicians of his day who found refuge and welcome at the Spanish court where he was already on familiar terms in 1548. Six years later he accompanied Juana, the Infanta, to Lisbon where she was to be married to Dom João. He seems to have visited England and Holland with Philip II, and he may have been to Paris. He was assassinated in 1561. His most famous work is a pastoral novel entitled ‘Diana Enamorada’ (Madrid, between 1545 and 1559). Inflated in style, artificial in its depicting of character, indifferent in poetical value yet, as Cervantes had said, «it has the honor of being the first of the books of its class.» Partly in verse and partly in prose, the latter is much the superior. The ‘Diana’ is written principally in Spanish, but it contains songs and prose passages in Portuguese. It became immensely popular and was widely imitated not alone in Spain but in the other countries of southern and western Europe. It was translated into English by Bartholomew Young in 1583 and published in 1598 and was very widely read in England. Sidney's ‘Arcadia’ probably owed its existence to the ‘Diana’ and it was certainly strongly influenced by it; and Shakespeare, in ‘Two Gentlemen of Verona’ and in parts of other plays shows the effect that the ‘Diana’ had already had upon English literature. Montemayor's work, being modeled on the Italian pastoral novel which had, to a certain extent, already had its influence upon English literature, the ‘Diana’ found the proper soil in which to plant itself. Montemayor, who had not finished the ‘Diana Enamorada’ at the time of his death, left instructions that it should be completed by Dr. Alonso Pérez of Salamanca who wrote accordingly ‘Segundo del Salamantino’ in 1564. In the same year Gil Polo wrote a second ‘Diana Enamorada.’ Both of these books are patent imitations of Montemayor's novel. Scores of other imitations followed, among the authors thereof being no less personages than Cervantes and Lope de Vega. The ‘Cancionero’ of Montemayor (2 vols., Antwerp 1544–58) contains some of his own lyrics. An edition of Montemayor's works was published in Barcelona in 1886.

Bibliography.— Butler, Clark H., ‘Spanish Literature’ (London 1909); Fitzmaurice-Kelly, James, ‘A History of Spanish Literature’ (1898); also article in the *Revue hispanique* (1895, Vol. II, pp. 304–311); Garcia Pérez, Domingo, ‘Catálago razonado biográfico y bibliográfico de los autores portugueses que escribieron en castellano’ (Madrid 1890); Gimaães, D., ‘Birnardin Ribeiro’ (Lisbon 1908); Marsan, J., ‘La pastorale dramatique en France’ (Paris 1905); Miléndez y Pelayo, Marcelino, ‘Los siete libros de la Diana’ (Vol. VII, *Nueva Biblioteca de Autores Españoles*); ‘Orige nes de la novela’ (Vol. I, *Nueva Biblioteca de Autores Españoles*); Rennert, H. A., ‘The Spanish Pastoral Novel’ (Philadelphia 1912); Schönherr, G., ‘Jorge de Montemayor, sein Leben und sein Schäferroman’ (Halle 1886); Ticknor, G., ‘History of Spanish Literature’ (New York 1854).

MONTENEGRO, mōn-tē-nā'grō (native, *Tzernagora*; Turkish, *Karadagh*, Black Mountain), a former kingdom northwest of Turkey, bounded north by Bosnia and Herzegovina, east by Bosnia, south by Albania and west by the Adriatic Sea and a strip of Dalmatia. Its area was increased by the Treaty of Berlin of July 1878, from about 1,710 to about 3,630 square miles, and after the Balkan War in 1913 to about 5,603 square miles. The country is a succession of elevated ridges, diversified here and there by a lofty mountain peak, some of them attaining elevations of 5,000 or 6,000 feet, or even 8,000 feet on the borders of the country, with a few beautiful and verdant plains and valleys, in which the soil is tolerably fertile; chief of these are the department of Tzernitza and the valleys of Bielopavlich, watered by several streams, the principal of which is the Mortasa, which falls into the Lake of Scutari. The climate is healthful. Forests of oaks and holly, ash, beech, firs, walnuts, hazel, wild pears, poplars, willows, alders and the sumach, used for dyeing and tanning, cover many of the mountain sides. The cultivated productions are corn, potatoes, cabbage, cauliflower and tobacco, with several kinds of fruit-trees, including the peach, olive, pomegranate, mulberry and others. In the department of Tzernitza, already mentioned, apples, vines, carobs, almonds, figs, quinces, walnuts, etc., also grow in abundance. Agriculture is in a rude state, though every cultivable piece of land, even if only a few feet square, is planted with corn, potatoes or some other useful plant. Sheep, goats and pigs are reared in great numbers; the two former affording a profitable supply of wool and cheese for exportation. Game is not abundant, but fish are taken in great quantities, and are of excellent quality, particularly the trout, which are celebrated, and some of them of immense size; and a kind of carp is caught in large quantities, and dried and salted for export to Vienna and Trieste. Manufactures, with exception of a coarse woolen stuff, are unknown. The chief occupations of the inhabitants are agriculture and fishing; the latter carried on principally in the Lake of Scutari, which lies partly in Albania. The exports of Montenegro are smoked mutton-hams, salted fish, wax, honey, hides, tallow, cheese, butter, cattle and other agricultural produce. The chief imports are cattle, tobacco, salt, wine, brandy, coffee, sugar and manufactured goods. The Montenegrins belong to the Serbian branch of the Slavonic family of peoples. They are generally of tall stature and well proportioned, with singularly powerful voices, which enable them to carry on conversations at incredible distances; foreheads good, face rather square, moderately aquiline or straight nose and animated eyes. Both men and women are robust: the latter are often beautiful when young but soon lose their good looks by laborious and unfeminine occupations. The people generally are cheerful in manner, extremely brave and hospitable and courteous to all except the Turks, whom they hate. The men go at all times fully armed. The houses are of stone, generally with thatched roofs; but many are covered partly or entirely with wooden shingles. There are few towns in Montenegro, but there are some 300 villages; Cettinje (q.v.) is the capital; Podgoritza (pop. 14,000); and the seaports Dulcigno and Antivari are the principal towns. The language of the Montenegrins is a Slavonic dialect. In religion they are all of the Greek Church. Education, which was formerly much neglected, is now becoming freely diffused, the public schools having increased from one in 1851 to about 70 in 1890. Montenegro, until 1851, was a theocracy, governed by a Vladika or prince, who was at once a bishop, a judge, a legislator and a commander-in-chief. The office was hereditary in the family of Petrovitch from 1697. But as the Vladika could not marry, the dignity was inherited through brothers and nephews. In 1851 the civil and ecclesiastical offices were disjoined, the Vladika confining himself to the latter, while the former devolved on the Hospodar. The revenue of the principality was estimated for 1914 at about $390,000. Montenegro has no coinage of its own. Pop. about 516,000.

Montenegro formed a part of ancient Illyria, and in the Middle Ages belonged to the great Serbian kingdom. The origin of the sacerdotal power dates from 1516, when the secular prince, having no children, withdrew to Venice, and transferred the government to the Archbishop Germanos. In the reign of Peter the Great the Montenegrins placed themselves under the protection of Russia, both sharing in a common enmity against the Turks. In 1796 the Prince-bishop, Pietro I, inflicted such a loss on the Pasha of Scutari, who had invaded Montenegro, that for many years they left it unmolested. Pietro II (1830–51) made strenuous efforts to improve the condition of his people by liberalizing the constitution, and attempting to reclaim his subjects from their vindictive and predatory habits. His successor, Danilo I, having separated the civil and ecclesiastical offices, Russia withdrew her subsidy of 8,000 ducats, but subsequently resumed payment of it, not, however, before great internal commotion had arisen from the necessary imposition of taxes to meet the deficit so caused. The Turks, led by Omar Pasha, again invaded the country, but a treaty was arranged 15 Feb. 1853. Danilo was assassinated in 1860, and was succeeded by Prince Nicholas I. In 1861 the Montenegrins excited a rebellion against the Turkish sway in the Herzegovina, the result of which was the infliction of such punishment on them that they were compelled (1862) to accept a disadvantageous peace, in which it agreed to the occupation of several points on the road from Herzegovina to Scutari by Turkish troops. In 1870, however, the principality managed to get these troops withdrawn. In 1876 Montenegro joined Serbia in a war against Turkey, and on the conclusion of the Russo-Turkish War of 1877–78, and the Balkan War in 1913, it received, as already mentioned, an accession of territory. On the 50th anniversary of his accession, 28 Aug. 1910, Nicholas I, by request of the National Skupshtina, assumed the title of king. When the European War began in 1914, Montenegro allied herself with Serbia, and in 1915 was overrun by the Teutonic forces. Ipek was captured, 6 Dec. 1915, and the capital, Cettinje, occupied, 13 Jan. 1916, the Montenegrin government retiring to Neuilly-sur-Seine, France. For later history see JUGO-SLAVIA. Consult Denton, W., 'Montenegro: Its People and Their History' (London 1877); Murray, W. S., 'The Making of the Balkan States' (London 1912); Stevenson, F. S., 'A History of Montenegro' (London 1912); Trevor, R., 'Montenegro, a Land of Warriors' (London 1913).

MONTENOTTE, mȯṅ'tā-nŏt'tā, Italy, village in the province of Genoa, in the district Savona, and located on the Cairo-Montenotte-Alessandria Railway. It is noted on account of the battle in which Napoleon won his first victory here, 12 April 1796, over the Austrians under Argenteau. It has but about 200 inhabitants.

MONTEPIN, mȯṅ'tā'păn, **Xavier Aymon, Count de,** French writer: b. Apremont, 18

March 1824; d. Paris, 30 April 1902. He was one of the most fertile and successful representatives of the strung-out *feuilleton* novel writers of small literary merit. Most of his novels appeared in fragments in the *Petit Journal* before being brought out in volume form, when they were dramatized by his friend Dornay for use on the *Ambigu* stage. Among the best-known works are ‹Confessions d'un Bohême› (1850); ‹Mignonne› (1851); ‹Mademoiselle Lucifer› (1853); ‹Les viveurs de Paris› (1852–56, 14 vols.); ‹La maison maudite› (1867); ‹Les tragédies de Paris› (1874); ‹La Majesté l'Argent› (1877); ‹Trois millions de dot› (1891), etc. Successfully placed on the stage were ‹Le Connétable de Bourbon› (1850); ‹La Sierene de Paris› (1860); ‹Le médecin des pauvres› (1865); ‹La porteuse de pain› (1889); ‹La joneuse d'orgue› (1896).

MONTEPULCIANO, mȯṅ′tā-pu̇l-chä′nō, Italy, a district capital in the province Siena, located on one of the Subapennine heights of Tuscany and on the Empoli-Chiusi Railway. It has churches and palaces dating from the 14th to the 17th centuries, among which are the cathedral with its funeral monuments by Donatello and Michelozzo, and the beautiful cupola church Madonna di Saint Viaggio outside the town, started by Antonio da Sangallo the Elder (1518); an ancient castle, 14th century town-hall, gymnasium, technical school, library, collection of ancient Etruscan antiquities, etc. It has an excellent wine culture and produces much oil and silk. It is the birthplace of Cardinal Bellarmin and the sage and poet, Angelo Ambrogini (Poliziano). Its population in 1911 was 15,994 in the entire commune.

MONTEREAU, mȯṅ′tĕ-rō, France, a town in the department Seine-et-Marne and arrondissement Fontainebleau, located on the left bank of the Seine which is here joined by the Yonne. It is the junction of the Lyons and East railways and has a church dating from the 13th–16th centuries, a statue of Napoleon I on the Seine bridge, a commercial court of justice, chamber of manufactures, military hospital. Among its chief manufactures are porcelain, earthenware, mosaic tiles, shoes, agricultural machines, etc. Considerable trade is done in wine, grain, wood and cattle. This location was the Gallo-Roman Condate and received its name in the 6th century from a monastery (*Monasteriolum*). Duke John the Fearless (q.v.) was assassinated (1419) on the Yonne bridge here by the followers of the Dauphin. In the vicinity the French, under Napoleon I (18 Feb. 1814), won a victory over the Allies.

MONTEREY, mȯṅ-tĕ-rā, Cal., city in Monterey County, on Monterey Bay and on the Southern Pacific Railroad, about 100 miles south by east of San Francisco. The site of the city was first discovered by Juan Rodriguez Cabrillo in 1542. In 1602 it was rediscovered by Viscaino, who named it «Monterey» in honor of his patron, the Vicomte de Monterey, but it was not until 1770 that the Spanish, under Junipero Serra, made the first settlements and founded the mission San Carlos de Borromeo de Monterey, the second in California. From 1774 to 1825 it was the capital of the Spanish province. On 26 March 1825, the constitution of the republic of Mexico was ratified and the city remained the capital of California during Mexican rule. Commodore Jones, of the United States navy, captured the place in 1842 and held it for one day, under the erroneous impression that war had been declared against Mexico. On 7 July 1846 Monterey was captured by Commodore Sloat. The American flag was raised over the custom house, which still stands, and California passed to American rule. In 1849 the State Constitutional Convention was held here and the first legislature of the State of California met in Colton Hall, another historic building which still stands. In 1850 the place was incorporated. The section in which the city is located consists of farm lands upon which are raised grains and fruits. Fishing and stock-raising are prominent industries. Over 10,000,000 pounds of fish are packed here annually and many tons shipped to the market. The total annual value of the combined catch is estimated at $1,500,000. The combined resources of the Bank of Monterey and Monterey Savings Bank amounts to $1,193,386; the combined deposits to $999,625. Monterey is a favorite resort for summer and winter. Here is located the famous hotel and resort, Del Monte, with its 134 acres of beautiful gardens and grounds. Other points of interest are San Carlos Mission, Carmel Mission, home of Robert Louis Stevenson, home of Thomas O. Larkin, first American consul, headquarters of Generals Sherman and Halleck, ruins of the old Spanish fort, first brick house in California and the presidio of Monterey. It has good public and parish schools and a public library. The harbor at Monterey is the only undeveloped deep-water port on the Pacific Coast. It is the only harbor where vessels can enter in all kinds of weather and drop anchor without the aid of a pilot. Governmental appropriations aggregating $800,000 have been made for the construction of a breakwater to destroy the currents which make it dangerous for large vessels to lay alongside at times and which is the harbor's only defect. Pop. (1920) 5,479.

MONTEREY, Mexico, capital of the state of Nuevo Leon, situated at the foot of the Sierra Madre Mountains at an altitude of 1,800 feet above sea-level, an important railroad centre for trade and commerce with the United States, 168 miles from the Texas boundary. The most notable industry is an extensive iron and steel mill, which employs a great number of men and produces large quantities of heavy iron and steel manufactures, both rolled and cast. Over $25,000,000 are represented by the manufacturing and industrial enterprises of the city. No other point in northern Mexico is so important commercially, as Monterey. There are two local financial institutions, the Bank of Nuevo Leon, with a capital of $2,000,000 and the Mercantile Bank, with a capital of $2,500,000. The National Bank has a branch here and the Bank of London and Mexico an agency. The principal educational institutions are the School of Jurisprudence, Normal School for males, Normal School for females and the Academy of Drawing. There is a Natural History Museum and a well-equipped public library. The principal buildings of the city are the Juarez Theatre, the cathedral and the churches of San Francisco and the Purisima. The streets are well paved. In the centre of the city there is a large spring of clear water. Four miles distant are the Topo Chico Hot Springs, the hourly output of which is 68,000 gallons. The waters of these are much like those of the famous hot springs of Arkansas. The prevailing style of architecture is Moorish. Pop. 78,500. The city was founded by the Spaniards in 1585 as Ciudad de Leon but renamed Metropolitan City of Our Lady of Monterey in 1596. The city was besieged in 1846 by General Taylor and compelled to capitulate. See MONTEREY, BATTLE OF.

MONTEREY, Battle of, in American history; in the early part of the war between the United States and Mexico, Monterey, which occupies a strong natural position and was well fortified by art, was held by the Mexican General Ampudia, with about 10,000 regular troops. In August 1846, General Taylor (q.v.) with a force of 6,625 men, mostly volunteers, marched from Matamoras to attack Monterey; and on 9 September he encamped within three miles of the place. Ten days were spent in reconnoitring, and on the afternoon of 19 September General Worth was ordered to march with his division around the hill occupied by the bishop's palace, to take a position on the Saltillo road and to carry the enemy's detached works in that quarter, while the main body of the army were to make a diversion against the centre and left of the town by batteries erected during the night. In the morning these batteries opened upon the city, which replied by a heavy fire from the citadel and other works. The lower part of the city was assaulted and entered by the Americans, and a Mexican work of great strength captured after hard fighting by a brigade under General Quitman. General Butler also entered the town at another point with the 1st Ohio regiment. Meanwhile General Worth carried the heights south of the river and the Saltillo road, and turned the guns of the Mexican works in that quarter upon the bishop's palace. The Mexicans evacuated the lower part of the city during the night, and early next morning General Worth stormed the height overlooking the bishop's palace; and by noon that stronghold itself was taken by the Americans and its guns turned upon its flying defenders. The houses of the city being solidly built and capable of defense, and the streets strongly barricaded, the Americans were forced to take each house in succession by breaking through the walls till they reached the principal plaza. The conflict lasted till the 23d, the Mexicans contesting desperately every foot of ground till nothing remained in their possession but the citadel. On the morning of the 24th General Ampudia capitulated and was allowed with his army to march out with the honors of war. The loss of the Americans in these operations at Monterey was 120 killed and 368 wounded. That of the Mexicans was not ascertained, but was probably much greater. See MEXICAN WAR. Consult Howard, O. O., ‘General Taylor’ (New York 1892); Ladd, H. O., ‘The War with Mexico’ (New York 1883); McElroy, R. M., ‘The Winning of the Far West’ (New York 1914).

MONTESA, mȯṅ-tā'sạ, **Order of Our Lady of,** one of the Spanish military orders established by James II of Aragon (1319) after the fall of the Knights Templar (1311) and endowed with the latter's estates. The town and castle of Montesa also came into their possession as residence. The order followed the rule of the Benedictines. In 1587 it became united with the Spanish Crown and in 1872 was abolished, to be re-established in 1874. The decoration of the order is a golden lozenge with a red cross in the field surmounted by a trophy on a red ribbon. The garb is a white mantle with red cross. The knights are divided into *Caballeros profesos* and *Caballeros novicios.*

MONTESANO mont-e-sano, Wash., town, county-seat of Gray's Harbor County, on the Chehalis River, at the head of tide-water navigation and on the Northern Pacific Railroad, about 45 miles west by south of Olympia. It is in a region in which the chief occupations are farming, lumbering and fishing. It manufactures considerable lumber and lumber products and has creameries and important salmon fisheries. Three miles above the town on the Chehalis River is a salmon hatchery. Pop. (1920) 2,158.

MONTESINOS, mōn-tā-sē'nō, **Fernando,** Spanish historian: b. Osuna, Spain, 1593; d. Seville, Spain, 1655. He went to Lima, Peru, in 1610 and served under the government, afterward becoming visitor of the audencia of Charcas and councillor of the viceroy. By his considerate treatment of the Indians he won their friendship and their caciques placed at his disposal valuable information concerning their history. He ranks at the head of the Peruvian archæologists and he published several able works on metallurgy. Among his books are ‘Ophyr de España, ó anales de los reynós de Quito y Lima’ (16[illegible]0); ‘Memorias históricas del antiguo reyno de Quito’ (1652), etc. Consult Prescott's ‘History of Peru,’ Vols. I and II and Jiminez de la Espada, M. (ed.), ‘Memorias antiguas historiales y politicas del Peru’ (in ‘Coleccion de libros espanñoles raros ó curiosos’ Vol. XVI, Madrid 1882).

MONTESPAN, Françoise Athenais, frän-swäz äth-ë-nā mȯṅ-tĕs-päṅ, MARQUISE DE, mistress of Louis XIV of France: b. 1641; d. Bourbon-l'Archambault, 27 May 1707. She was the 2d daughter of the Duke of Mortemart, and was, in 1663, married to the Marquis de Montespan. To great beauty she added a natural liveliness and wit, and a highly-cultivated mind. Soon after her appearance at court she attracted the king's attention and from 1668 till 1674 shared his favor with Mlle. de la Vallière, but supplanting her in 1674; M. de Montespan after a detention in the Bastle had already been ordered to retire to his estate. Mme. de Montespan bore eight children to the king, four of whom died in infancy. The others were entrusted to the care of Mme. Scarron, afterward De Maintenon. The influence of Mme. de Montespan was often exercised in public affairs, and her sway over the king continued until about 1679, when a growing attachment to Mme. de Maintenon finally estranged his affections from Mme. de Montespan. She rarely appeared at court after 1685, and in 1691 entirely quitted it. Her last years were devoted to religious exercises, acts of benevolence and penitence. The regent Orléans married Mademoiselle de Blois, one of her daughters by the king.

MONTESQUIEU, Charles Louis de Secondat, Baron de la Brède et dè, French philosophical historian: b. at La Bride, near Bordeaux, 18 Jan. 1689; d. La Brède, 10 Feb. 1755. He was of a noble family, received an excellent education and studied law which was the family traditional profession. From his father and his mother he inherited titles, property and position, and his uncle, who died in 1716, left him his whole fortune, his very important judicial office of «président a mortier» and his old and noble family name of «Montesquieu.» The office thus bequeathed him he held for 12 years, but his serious occupation was writing on philosophy, politics, natural science and various other subjects. In 1721 his ‹Lettres persones› were published at Amsterdam anonymously. In these Montesquieu satirizes the follies of his age in literature, society, politics and religion. So popular were these letters that the public called for several editions in the first year following their publication. They pointed the way to a new field in literature and are credited with being the first book in the so-called «Philosophe» movement. Montesquieu became a sort of literary lion in Paris and he enjoyed his reputation and the peculiar advantages it brought him to the full. But to do this he sold the life tenure of his office in Brède and removed to the capitol in 1726, and two years later he was elected a member of the Académie Française. He suddenly resolved upon an extensive tour of Europe with the purpose of observing the life of the various countries visited. His tour took him to Austria, Hungary, Italy, England and the Rhine country and occupied nearly four years which were very fruitful in the life of the author. Returning to La Brède he set up a great study hall and library 60 feet long by 40 feet wide. The result of his work here was, in part, ‹Considérations sur les causes de la grandeur et de la décadence des Romains› which was published anonymously in Amsterdam in 1734. This became at once popular, not alone in France, but all over Europe, and was probably the most widely read of all Montesquieu's works. It opened the wide field of the philosophy of history. In the meantime he was carrying on deep and original researches for a still greater work. But he loved the literary salons and the brilliant life of Paris and much of his time was spent in the capital, however, not to the neglect of his literary investigations, for the ‹Esprit des lois,› the most original book of its age, appeared in Geneva in 1748. It was published in two volumes comprising in all 31 books. Though the ‹Esprit› met with considerable opposition at first, in France, it became popular in other European countries, and France soon also fell into line and Montesquieu was looked upon as the greatest literary man of his day. His passion for literary work continued; but most of his subsequent writings remained unpublished during his lifetime. His fame continued long after his death and for more than a century he was the one great authority of the moderate reform party, not alone in France, but also in other countries where the spirit of reform was abroad. Of all the early writers on the science of comparative politics and history he easily stands first on account of the actual excellence of the work done, the originality of thought which he constantly displays and the deep and lasting influence he had upon the thought of his own day and upon succeeding generations. In France, however, Montesquieu's enemies and detractors have accused him of being more English than French in literary form and in manner of thought; and, in fact, so great an admirer was he of everything English, that he was looked upon, during his lifetime and long afterward as an Anglomaniac. Montesquieu is a much more rational thinker than Voltaire, though the latter far outran him in popularity. The two men were, however, so far apart in their modes of thought that neither was able to appreciate the greatness of the other. The cool, moderate reasoning of Montesquieu was not only in every way fitted for the age in which he lived, but it was couched in language that attracted and commended itself to all men of liberal tendencies. Thus it was a preparation for the work that Voltaire himself was called upon to do; and both Montesquieu and Voltaire, though working along different lines and imbued each with a different spirit, were both on the broad road to the Revolution of 1789 and the rejuvenation of France. In an age when the real spirit of all just law was hidden from the sight of most men, the original, truthful and clear-cut views of Montesquieu on politics and their relation to law came as an inspiration and took hold of the imagination of thinking Europe. He made men think clearly and powerfully along lines that they had been unaccustomed to think rightly for centuries. His masterly genius for generalization may be said to have created the science of politics. His plain, unadorned, forceful language and withal beautiful composition is in marked contrast to the spirit that ruled the literature of his own and the following generation. To this simplicity of language and directness of thought he owed much of his popularity. Montesquieu was well known to the more inquiring spirits of the English colonies in America and his work had a strong influence over the revolutionary spirit that began to make itself felt among the colonies early in the latter half of the 18th century, where, during the struggle for independence, it became a veritable textbook of the Revolutionary party. There have been many editions of Montesquieu's works published in French and in all the languages of Europe. (See LES LETTRES PERSANES; SPIRIT OF THE LAWS). Consult Sorel (translated by Masson), ‹Montesquieu› (London 1887); Vian, ‹Histoire de la vie et des œuvres de Montesquieu› (Paris 1879); Lowell, E. J., ‹Eve of the French Revolution› (Boston 1893); Ilbert, C. P., ‹Montesquieu› (Oxford 1904); Dargan, E. P., ‹Æsthetic Doctrine of Montesquieu› (Baltimore 1907).

MONTESQUIOU-FEZENSAC, môṅ-tĕs-kē-oo-fā-zän-săk, **Robert,** COUNT DE, French poet: b. Paris, 9 March 1855. He was well known as an art collector and as an amateur goldsmith and enameler in 1892, when he published ‹Les Chauves-souris,› a volume of verse symbolizing the mystery of night. It was followed by ‹Chef des Odeurs suaves› (1893), of which the theme was flowers and perfumes, ‹Les Hortensias Bleus› (1896) and ‹Perles Rouges› (1899), the latter a series of sonnets reviving Versailles at its glory; by ‘Les Paons’ (1901), on precious stones and their mystic meanings; and by two volumes of essays, ‘Roseaux pensants’ (1897) and ‘Autels privilégiés’ (1899), both attempting to appreciate some wronged artist. Later works include ‘Professionelles beautés’ (1905); ‘Altesses sérénissimes’ (1907); ‘Assemblée de notables’ (1909); ‘La petite mademoiselle’ (1911); ‘L'inextricable graveur Rodolphe Bresdin’ (1913). He appeared in New York in the winter of 1902–03 as a lecturer and reader. His style is hyper-æsthetic, with much weird beauty, and his themes strangely far-fetched.

MONTESSORI, mon'tĕs-sō'rē, **Maria,** Italian educator: b. Rome, about 1872. She was educated to be a physician, and while studying applied herself especially to the investigation of nervous diseases in children, and to the problem of evolving a form of training that would draw out the capabilities of those of diseased and abnormal temperaments. She was the first woman to be graduated in medicine at the University of Rome (1894), and for some time she acted as an assistant in the Psychiatric Clinic and later as a lecturer on anthropology in that institution. Then for six years she was in charge of one of the hospitals for defective children in Rome. Having acquired a familiarity with the systems of Pestalozzi, Fröbel, Seguin, Itard and other early masters, she now developed therefrom a method of educating feeble-minded children under more modern conditions. In 1898–1900 she was directress of the Scuola Ortofrencia, or mind-strengthening school, where she met with marked success in applying the methods, particularly, of Seguin and Itard to the education of defectives. She then devoted herself to the study of experimental psychology, pedagogic anthropology and the methods of modern education. An occasion offered in 1907 for putting her theories to practical test, when a school was established in connection with the tenants erected by the Roman Association for Good Building. The first house (Cora dei Bambini) was opened in January 1907, and was soon followed by three others. Dr. Montessori maintained her connection with these schools until 1911 when she devoted her time to the extension of her methods to older children. Both professional educators and laymen have taken a deep interest in her work, the principles of which she has set down in ‘Antropologia pedagogica’ (Eng. trans. by F. T. Cooper, ‘Pedagogic Anthropology,’ New York 1913) and ‘Il metodo della pedagogia scientifica applicato all'educazione infantile nelle case dei Bambini’ (Eng. trans. by A. E. George, ‘The Montessori Method,’ New York 1912).

MONTEVERDE, mȯṅ'tā-vār'dā, or **MONTEVERDI, Claudio,** Italian composer: b. Cremona, May 1567; d. Venice, 29 Nov. 1643. He was a pupil of Ingegneri at Mantua, became (1590) violinist and singer at the Mantuan court and was appointed (1602) bandmaster. In 1613 he was appointed bandmaster of Saint Mark's, Venice, in which position he served till his death. His is one of the most interesting personalities in the history of modern music. He was a pioneer in opera and became noted as composer of madrigals before entering (1583) the operatic field. Among his operas are ‘Orfeo’ (1607); ‘Arianna’ (1608); ‘Proserpina rapita’ (1630); ‘Adone’ (1639); ‘Enca e Lavinia’ (1641); ‘Ulisse’ (1641); ‘L'incoronatione di Pappea’ (1642). He also composed a ballet, ‘Tirsi e Clori’ (1615) and the dramatic scene ‘Il combattimento di Tancredi e Clorinda’ (1624), besides numerous religious works as masses, psalms, motets, etc. Consult Vogel, Emil, ‘Claudio Montéverdé’ (in *Vierteljahrsschrift für Musikwissenschaft* 1889); Goldsmith, ‘Studien der geschichte der Italienischen Opera in 17 Jahrhundert’ (Leipzig 1904); Mitjana, Rafael, ‘Claudio Monteverde’ (Malaga 1911).

MONTEVERDE, Giulio, Italian sculptor: b. Bistagno, 8 Oct. 1837. He was at first woodcarver, but went to the academy at Genoa (1859) and won (1865) the Prize of Rome. His first works were a statuette of ‘Columbus as a Boy,’ ‘a Group of Children playing with a Cat,’ ‘the Genius of Franklin,’ copies of which are found everywhere. He became noted outside Italy by his group ‘Jenner inoculating his own Child,’ a work showing great refinement and sentiment. Of his more recent works should be mentioned ‘Crucifixion’ in marble; memorial to Bellini for Catania; King Victor Emanuel for Bologna (1888). From 1874 he has been professor of San Luca Academy at Rome.

MONTEVIDEO, Minn., village, county-seat of Chippewa County, at the junction of the Minnesota and the Chippewa rivers, and on the Chicago, Milwaukee and Saint Paul Railroad, about 125 miles west of Saint Paul. It is in a fertile agricultural region where wheat is one of the important products. The chief industrial establishments are flour-mills, grain elevators, a creamery, cheese factories and a cooperage. It is the seat of Windom Institute (Congregational) and it has a high school, a public library and a town-hall. Near the village is a monument erected to commemorate the surrender of Little Crow, the Sioux chief, in 1862. Pop. (1920) 4,419.

MONTEVIDEO, mŏn-tĕ-vĭd'ę-ō (Sp. mōn-tā-vē'dā-ō), Uruguay, capital of the department of the same name; also capital and emporium of the republic; situated on the northern coast of the Rio de la Plata (see La Plata, Rio de). Founded in 1726, its inhabitants numbered only 3,500 in 1818, and 9,000 in 1829; indeed, it was scarcely more than a fortress until 1834, and at various times the governments of Argentina, England and Brazil attempted to gain possession of this stronghold, commanding the entrance of the great waterway of the south. Montevideo was taken by a British force of 4,600 men on 2 Feb. 1807, after a vigorous assault by land and sea (English fleet under Commodore Popham). Subsequently the combined English forces in the river, under command of General Whitelocke, were defeated at Buenos Aires, and, withdrawing from Montevideo, abandoned the Rio de la Plata. The demolition of the walls, the opening of new streets, and (in 1836) the beginning of foreign immigration, transformed the place. In the years from 1838 to 1841, about 28,000 European immigrants entered the port. There were 45,000 inhabitants in 1860; 105,000 in 1872; 238,080 in 1892; and at the beginning of 1902 about 278,186 in the territory of 256 square miles embraced in the department. Immigrants arriving in 1901 were: Italian, 3,777; Spanish, 2,708; Brazilian, 715; French, 512; German, 336; and English, 209. The harbor is the best on the Rio de la Plata; but formerly was far from satisfactory. An elaborate system of moles and docks, projected for harbor improvement, began in July 1901. The water at the harbor's entrance being but 15 to 17 feet deep, vessels of great draught formerly anchored in the outer roadstead and discharged their cargoes on lighters. Since 1913 further improvements have increased the port's facilities. The city is built on a chain of hills of moderate elevation with a gradual slope toward the shore; the conditions are therefore favorable for efficient drainage. An active commerce is maintained with foreign countries and towns of the interior. As it is the only port of entry it furnishes nearly all of the revenue of the government, receiving or forwarding about 90 per cent of the importations of the entire country and about 67 per cent of the total exportations. The imports in a recent year amounted to $21,876,987, and exports to $23,340,239. The steamers of 20 different companies, including 12 British and three French, visit the port periodically. Conspicuous buildings are the Parliament House, Government Palace, National Bank, Solis and San Felipe theatres, Uruguay Club and School of Arts and Sciences. There are commercial houses of every class, street railways, telegraph and telephone service, electric-light works, printing establishments and foundries. The streets are wide, straight and generally well kept. The water supply is obtained from the Saint Lucia River, at a point about 12 miles distant. Plazas, 16 in number, occupy high ground in the middle of the city, the most attractive of these public squares being the Zabala, Independencia and Constitución. The University of Uruguay has more than 400 students and a relatively very large number of native and foreign professors; there are also normal and elementary schools, a military college, etc. Banks are: English (2), and Italian, Spanish and French (1 each). No city in South America is more cosmopolitan in character: nearly all the languages of the civilized world are heard in its streets. The environs contain beautiful residences surrounded by gardens; at a distance of about three miles from the city is the fine park called El Prado.

Marrion Wilcox.

MONTEVIDEO, Department of. See Uruguay.

MONTEZ, Lola (assumed name of Marie Dolores Eliza Rosanna Gilbert), adventuress: b. Limerick, Ireland, 1818; d. Astoria, N. Y., 17 Jan. 1861. Her parents took the child to India, where her father died, and her mother, again marrying, sent Lola back to Europe. In 1837 she married a Captain James, went to India with him, tired of him and returned to England in 1842. She next became a public dancer, performing in London and in cities of the Continent, and in 1846 went to Munich, where she fascinated the old artist-king Louis I of Bavaria who made her his mistress, created her Countess of Landsfield and granted her a large annuity. For a while she also exercised great political power, which she directed against the Jesuits and in favor of liberalism; but with the outbreak of the Revolution of 1848 she was once more set adrift. In London she married a guardsman, Stafford Heald, was soon divorced from him and in 1851 sailed for the United States. After touring through this country with a play called ‹Lola Montez in Bavaria,› she went to Australia, returned here, was twice married in California and in 1858 lectured in New York where she settled and spent her last days in rescue work among women. Her writings include ‹Lectures,› with an autobiography, and ‹The Arts of Beauty› (1858).

MONTEZUMA, mŏn-tẹ-zoo′mą (Aztec Montecuhzoma, the severe or sad one; found written also Monteçuma, Moctezuma, Muteczuma, Motezuma), surnamed Ilhuicamina (archer of heaven) and called Montezuma I, chief, or emperor, of ancient Mexico: b. about 1390; d. 1464. He succeeded his brother Izcohuatl in the chieftainship in 1436, but was not inaugurated until 1440. His success in war with neighboring tribes was great, and he is said to have extended Mexican conquest to the Gulf. With Netzahualcoyotl, chief of Tezcuco, he built, to prevent inundations from Lake Tezcuco, huge dams, the ruins of which in the San Lorenzo Valley have shown them to have been a marvelous feat of engineering. He also rebuilt Tenochtitlan (on the site of the modern Mexico), the chief Aztec city, substituting for the primitive buildings others of lime and stone; established a severe legal code and developed the ceremonial and influence of the tribal religion. Consult Bancroft, H. H., ‹Native Races› (San Francisco 1874–82).

MONTEZUMA, surnamed Xocoyotzin and called Montezuma II, chief, or emperor, of ancient Mexico: b. 1479 (authority of Bernal Diaz); d. Tenochtitlan, Mexico, 30 June 1520. He is well known as the ruler of the Aztecs at the time of the Spanish invasion. He succeeded his uncle Ahuizotl as chief in 1503. Almost constant wars were carried on by him with the Tarascans and Tlascalans, and he is said to have led an expedition as far south as Honduras. His internal policy was in many respects wise. He severely enforced the laws, introduced valuable changes in the courts and built many public works, including temples, a new conduit for the water supply and a hospital for invalided warriors. But by his arrogance and pomp, his seclusion, his restriction of appointments to those only of noble rank and his heavy taxation he made himself greatly disliked. His conquests enlarged the empire, but the various parts were without cohesion, and insurrections were frequent. When news was brought in 1518 that ships and white men (of Jean de Grijälva's expedition) had been seen off the coast, Montezuma was greatly alarmed, because an ancient prophecy foretold that Quetzalcoatl, the white god, would at some time come to reign over Mexico. He sent presents to Cortéz, who had landed at Vera Cruz in April 1519, and tried to prevent him from marching to Tenochtitlan. Cortéz, however, arrived there in November and was well received. Fearing an outbreak of the people, who did not agree with the conciliating policy of the monarch, Cortéz then took Montezuma prisoner and retained him as a hostage in the quarters of the Spaniards. The Aztecs finally made an attack upon the quarters (June 1520). Montezuma, at the request of Cortéz, attempted in a speech from the wall to end hostilities, but was wounded by a volley of stones and died four days later. The Indians came to regard him as a deity, and indeed called him their chief god, though this reverence did not include worship. Consult Prescott, W. H., ‹Conquest of Mexico› (1843); Bancroft, H. H., ‹Mexico,› Vol. I (Vol. IX of his ‹Works› 1883–90); Diaz, B., ‹Historia verdadara de la conquista de la Nueva España.›

MONTEZUMA, Iowa, town, county-seat of Poweshiek County, on the Chicago, Rock Island and Pacific and the Iowa Central railroads, about 60 miles east of Des Moines. Agriculture and stock-raising are the principal industries of the surrounding region. Bituminous coal-fields are in the vicinity. The chief industrial establishments are a pearl-button factory, wagon factory, foundry, machine-shop and a creamery. Pop. 1,200.

MONTEZUMA CASTLE. A remarkable prehistoric dwelling situated in an alcove in a high cliff on the west bank of Beaver Creek, three miles from old Camp Verde, near Prescott, Ariz. It is accredited to Aztecs and even supposed to have been occupied by Montezuma, but ethnologists doubt the validity of this claim, or especially of the existence of any evidence to sustain it. The building consists of five stories, with walls two feet thick at base. It contains about 20 rooms, most of them extending along cliffs which support the higher stories. The structure shows evidence of having been occupied a long time. It was repaired by the Arizona Antiquarian Society in 1895, and in 1906 was made a National Monument. Consult description by Mearns in *Popular Science Monthly*, 1890.

MONTFAUCON, Bernard de, bãr-när dė môṅ-fō-kôṅ, French critic and classical scholar: b. Languedoc, France, 18 Jan. 1655; d. Paris, 21 Dec. 1741. He entered the army but resigned to become a Benedictine monk and devoted himself to classical studies. His ‹Palæographia Græca,› published in 1708, made him famous and constituted him the founder of scientific palæography. He traveled in Italy where he was honored by Innocent XII, and in 1719 was elected a member of the Academy of Inscriptions. In the course of his work he examined thousands of manuscripts and his books are a storehouse of classical archæology. Among them are ‹LAntiquité expliquée et representée en Figures› (15 vols., 1719–24); ‹Monuments de la Monarchie française› (5 vols., 1729–33). Consult De Broglie, ‹Bernard de Montfaucon et les Bernardins› (Paris 1891).

MONTFERRAT, môṅ-fĕr-rä, Italy, a former independent duchy, bounded by Piedmont, Genoa and the Milanese territory. It lay in two detached portions between the Maritime Alps and the Po and had an area of about 1,000 square miles. The capital was Casale. Mention is made of a Marquis of Montferrat in 980. In 1305 the marquisate was inherited by a branch of the imperial family of the Palæologi, and in 1536 was granted by Charles V to Federico II, duke of Mantua. It was erected into a duchy by Maximilian in 1573 or 1574. In 1631 a considerable part of it was ceded to Savoy by the Duke of Mantua, to whose ancestors Charles V had granted it in 1536, and in 1703 the remainder was annexed to the same duchy. See Savoy.

MONTFORT, mŏnt′fōrt (Fr. môṅ-fôr), **Simon de**, Earl of Leicester, English political reformer: b. France, about 1208; d. Evesham, 4 Aug. 1265. His father was Simon, the Conqueror of the Albigenses, his mother, Alice of Montmorency; the former had been disinherited of his English estates by King John in 1207 and hence had joined the more readily the orthodox French party in fighting the Albigenses, who were led by John's brother-in-law, Raymond of Toulouse. But the younger and greater Simon in 1229 was forced to leave France and throw himself on the mercy of the English king, Henry III, who restored him his lands in Leicester and married him to his own sister Eleanor, the young widow of Lord Pembroke, secretly and without dowry in 1238. The irregularity of this match endangered Simon with the nobles, who had not been consulted; almost immediately afterward he quarreled with the king and was only saved by his crusader's vow, which he fulfilled under Richard of Cornwall in 1240. In France he fought under Henry III (1242–48), who made him commander of the army in Gascony. There he crushed successive rebellions, but another quarrel between the monarch and his subject followed and Simon was removed from office. Henry soon had to recall Simon, who in 1257 and 1258 quarreled hotly with William of Valence, one of the king's foreign favorites and his half-brother. Simon's boldness in this matter put him at the head of the movement among the barons for administrative reform. In June 1258 the 24 commissioners, of whom he was one, drew up the famous Provisions of Oxford, signed in October of the same year, but repudiated in 1262 by the king. Simon de Montfort had been actual head of the reforming party since the conclusion of the peace with France (4 Dec. 1259) which had made reform possible. Now, after the cause of the nobles had been submitted to the king of France to arbitrate and his sentence had been entirely favorable to the king, setting aside the Oxford Provisions entirely and reserving to the people only such rights as they had before possessed, Simon put himself at the head of the party which was eager to fight for the privileges of the nobles. On 16 May 1264, after a brilliantly conducted engagement, Simon captured the king; a new constitution was formed giving the power to a council of nine, over whom were three electors, removable by Parliament; and in this new régime Simon was practically master of the kingdom. He summoned a Parliament 30 Jan. 1265, which was the actual basis of the present English Parliament and of British constitutional freedom. But the Parliament was marked by a quarrel between Simon and the Earl of Gloucester; the latter went over to the border nobles. Simon moved against him with splendid fearlessness; made a sudden peace with the Welsh king, and turning to meet Gloucester failed to effect a juncture with his son. At Evesham on 4 Aug. 1265, fighting to the last and scorning to retreat, he was slain, his forces being so outnumbered by the troops with Gloucester and Prince Edward that at sight of the enemy Simon is said to have exclaimed, «Let us commend our souls to God, for our bodies are theirs.» Personally haughty and high tempered, but sober, simple, pious and cultured, he was a great general, one who stood firmly by the right, the idol of the people, who made his tomb a shrine and carried on the work he had begun. To call him the «creator of the House of Commons,» however, is a misapprehension of his work, which forwarded rather than fathered representative government. Consult Pauli's life which treats primarily of the constitutional bearings of Montfort's career and is translated into English by Miss Goodwin (1876); the English life by Prothero (1877); the French biography by Bémont (1884), which first untangles Montfort's continental career; the ‹Song of Lewes› (edited by Kingsford, 1890); the ‹Miracles of Simon de Montfort› (edited by Halliwell for the Camden Society, 1840), showing the popular canonization of the hero; and such general works as Stubbs, ‹Constitutional History› (Vol. II, 6th ed., Oxford 1897), and Green, ‹History of the English People› (Vol. I, new ed., London 1908).

MONTGOLFIER, mŏnt-gŏl'fĭ-ėr (Fr. môṅ-gŏl-fē-ā), two French inventors, JOSEPH MICHEL (b. Vidalon-les-Annonai, France, 1740; d. Balarue-les-Bains, 26 June 1810); and JACQUES ETIENNE (b. Vidalon-les-Annonai, 7 Jan. 1745; d. Servières, 2 Aug. 1799). They were sons of a paper-maker and devoted themselves to the study of mathematics, mechanics, physics and chemistry. As their scientific labors were always carried on in combination it is not easy to decide to which of the two the credit of their several inventions is due. The first idea of the balloon seems to have arisen in the mind of Joseph, but Jacques Etienne suggested many improvements upon it. Joseph was also the inventor, among other things, of the water-ram which raises water to the height of 60 feet, and Jacques Etienne of vellum paper, which he was the first to make in the manufactory formerly carried on by his father. See BALLOON.

MONTGOMERY, môṅ-gōm-ē-rē, **Gabriel**, COUNT DE, French captain: b. about 1530; d. Paris, 26 June 1574. He was son of the commander of the Scottish troops in the service of the French court, but in 1559 he accidentally wounded King Henry II with whom he was tilting and killed him. Montgomery was condemned to retirement in the country, where he read many religious books, and was soon led to join the Protestant party. In 1562 he entered Condé's army, serving with much bravery and ability. He saved himself by the swiftness of his horse during the Massacre of Saint Bartholomew. In 1574 he led a band of Huguenots and began war in Normandy, was captured at Domfront, taken to Paris, tried and beheaded.

MONTGOMERY, mont-gŭm'ē-rĭ, **George**, American Roman Catholic archbishop: b. Daviess County, Ky., 30 Dec. 1847; d. San Francisco, Cal., 10 Jan. 1907. He was educated at Saint Charles College, Maryland, and Saint Mary's Seminary, Baltimore, and was ordained to the priesthood in 1879. He officiated as a priest for 15 years in San Francisco and in 1894 was consecrated coadjutor bishop of Los Angeles. He was elevated to the rank of coadjutor archbishop of San Francisco in 1902.

MONTGOMERY, James, British poet and journalist: b. Irvine, Ayrshire, 4 Nov. 1771; d. Sheffield, Yorkshire, 30 April 1854. The son of a Moravian divine, he was educated for the ministry at the Fulneck Moravian Seminary near Leeds, but in 1792 he procured an engagement with a bookseller in Sheffield the proprietor, editor and publisher of the local *Register*. Montgomery succeeded him later as editor and publisher of the paper, the name of which he changed to the *Sheffield Iris*. The publication of a liberal journal was at that period fraught with manifold dangers. He was twice prosecuted for trivial offenses and condemned on the first occasion to three and on the second to six months' imprisonment. During his confinement he composed a volume of poems, ‹Prison Amusements,› published in 1797. In 1806 appeared his ‹Wanderer in Switzerland,› his first popular effort. It was followed in 1809 by the ‹West Indies,› a poem exposing the iniquities of the slave trade. Later volumes were ‹The World before the Flood› (1813); ‹Greenland,› a missionary poem (1819); and ‹The Pelican Island› (1827). In 1825 he resigned the editorship of the *Iris* and passed the remainder of his life in religious and literary work. To the world of to-day he is known as a hymn writer. Over 100 of his hymns still keep their places in hymnals, their authorship frequently and unfortunately confounded with the work of Robert Montgomery (q.v.). Consult Carruthers, ed., ‹Political Works of James Montgomery (Boston 1860); Holland and Everett, ‹Memoirs› (London 1854–56); King, ‹Life of James Montgomery› (London 1858).

MONTGOMERY, John Berrien, American naval officer: b. Allentown, N. J., 17 Nov. 1794; d. Carlisle, Pa., 25 March 1873. In 1812 he entered the navy as midshipman and was on board Perry's flagship at the victory on Lake Erie in 1813 where for gallant service he received the thanks of Congress. He was later engaged at Mackinaw in 1814 and in 1815 served in the Algerine war. In 1839 he became commander, and in the war with Mexico, aboard the *Portsmouth*, established United States authority on the coast of California, blockaded Mazatlan and assisted in the capture of Guaymas. In 1849–51 he was executive officer of the navy-yard at Washington and he commanded the Pacific squadron in 1861–62. He was made a commodore in 1862 and rear-admiral on the retired list in 1866. Consult Montgomery, T. H., ‹A Genealogical History of the Montgomery Family› (1863).

MONTGOMERY, Richard, American soldier: b. Convoy House, near Raphoe, Ireland, 2 Dec. 1736; d. Quebec, 31 Dec. 1775. At 18 he obtained a commission in the British army, in 1757 began his career of active service in America, and at the siege of Louisburg in 1758 and elsewhere gave evidence of high military capacity. After a period of residence in England from 1765, in 1772 he sold out his commission and, emigrating to New York, settled in Rhinebeck, Dutchess County. In 1775 he represented Dutchess County in the provincial Congress, and in the same year was appointed one of the eight brigadiers to serve in the newly organized army of the united colonies of the young Republic. He was immediately attached to the larger of the two divisions sent to Canada in the summer of 1775 and by a series of well-directed movements successively acquired possession of Chambly, Saint John's and Montreal, thereby becoming in the middle of November master of a great part of Canada. Effecting a junction on 4 December with Arnold's troops, then recently arrived, he immediately proceeded to take a position before Quebec. At a council of officers it was determined to attempt to capture the place by a *coup de main,* and accordingly, on 31 December at 2 A.M., an attack on the town was begun. Montgomery, who headed the attack on the Cape Diamond bastion, fell dead at the first and only discharge by the British artillerymen. His men, panic-stricken by the loss of their leader, began a disorderly retreat, and the assault on the city ended in failure. He was interred within the city walls. British statesmen vied with Americans in their praise of Montgomery. Congress testified «their grateful remembrance, profound respect, and high veneration» by placing a monumental tablet to his memory in the front of Saint Paul's Church, Broadway, New York. In 1818 the State of New York had his remains transferred from Canada and buried with imposing solemnities beneath the monument. Consult Armstrong, ‹Life of Richard Montgomery› (in ‹American Biography,› Sparks, J., ed., Boston 1834).

MONTGOMERY, Robert, English versifier and Anglican clergyman: b. Bath, 1807; d. Brighton, 3 Dec. 1855. His name survives chiefly through the merciless criticism and ridicule of his work by Lord Macaulay in the *Edinburgh Review.* Having taken orders in the Church of England, he officiated at Percy Street Chapel in London till his death in 1855, with an interval of four years as pastor of Saint Jude's Episcopal Chapel in Glasgow. His chief works, overpraised by uncritical sentiment for their popular vein, amply justify Macaulay's strictures, though hardly their offensively dogmatic tone. They include ‹The Omnipresence of the Deity› (1828); ‹Satan› (1839), whence his sobriquet of «Satan Montgomery,» and ‹The Messiah.›

MONTGOMERY, Ala., State capital and third city of the State in population, and seat of Montgomery County, 52 miles southeast of the centre; on the left bank of the Alabama, 410 miles above the Gulf by water and 180 by rail. It is the greatest railroad centre in the State, seven lines converging there, the Louisville and Nashville, Mobile and Ohio, Atlantic Coast Line, Central of Georgia, Seaboard Air Line, Union Springs and Northern and Western of Alabama; 62 passenger trains a day arrive and depart from its union station. The city is a leading Southern trade and social centre.

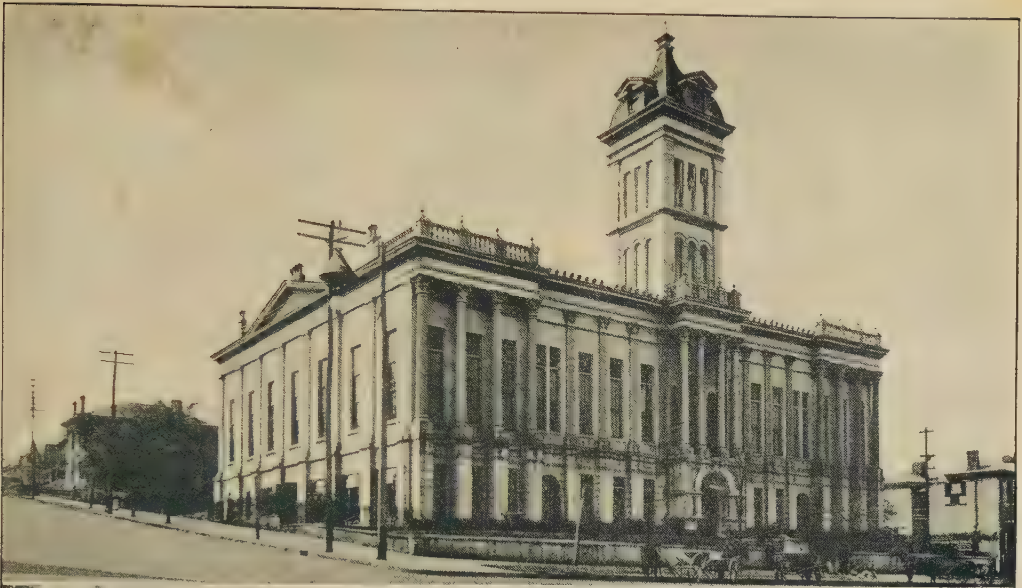
Commerce and Industry.— Montgomery lies in the heart of the famous Black Belt, the band of rich dark soil which stretches across and beyond Alabama, 120 miles wide, and one of the chief cotton districts in the country, as well as a great producer of grain, fruit and vegetables. It is the great central market of all this territory, and one of the foremost trucking centres for the supply of vegetables to the northern markets; its wholesale grocery business amounts to some $14,000,000 a year, out of a total of over $50,000,000. It is one of the chief cotton marts and distributing points of the South, handling 150,000 to 175,000 bales a year in its extensive warehouses. The export of this is, to some extent, sent in barges down the river to Mobile, and there reloaded for foreign shipment. The Alabama is one of the best rivers in the United States for steamer navigation, having a deep, broad channel open as high as Montgomery for eleven months in the year. Lying between the coal and iron fields on the north and the vast forests of yellow pine on the south, as well as in the midst of the cotton belt, the city has great natural advantages for manufacturing; and a dam across the Tallapoosa at Tallahassee, 30 miles away, furnishes 25,000 horse power applied to its manufactories, and used for trolley and lighting. An English syndicate, the Alabama Power Company, has developed other water power in this section with a potentiality of 500,000 horse power. Already electricity is sold in Montgomery as low as one cent per kilowatt hour. The city's interests are considerable and varied. There are 181 manufacturing enterprises, employing $12,000,000 capital and 6,000 employees. Carshops and foundry work for the numerous railroads, with boilers, and other iron goods, are the largest items; but there are two cotton factories and a cordage factory; four ginning and compress plants, five cotton-seed oil and cake works and 11 great fertilizer plants; 13 woodworking and lumber concerns, besides cooperage works (mainly for the oil and allied products), carriages, cabinets, show cases, furniture, confectionery, crackers and brushes and paper boxes, saddlery and harness, brick and tile, paving and roofing materials, etc.

The aviation depot, or aeroplane construction plant, of the United States government is located at Montgomery. It employs 600 civilian mechanics and is the only plant of its kind in America.

Finance and Government.—The city's banking facilities have kept pace with its commercial increase. In 1919 Montgomery had four national banks, and three State banks, having a combined capital of $2,500,000; surplus, $635,000; individual deposits, $13,000,000. The post-office receipts had increased 35 per cent within five years. There are trolley systems covering city and suburbs, and electric light, good sewerage and artesian water almost chemically pure; the streets are well paved and the country roads of remarkable excellence. Assessed valuation about $35,000,000. Of about $150,000 yearly expenditure, aside from interest on debt, $90,000 is spent for schools. Montgomery has commission government.

Public Buildings, Institutions, Etc.— The city is handsomely built on a high red clay bluff bordering the river, and stretching back to undulating hills; it has many fine old gardens, and 50 acres of public parks. The centre is Court Square, and the foundation streets are Court, Commerce, toward the river, and Dexter avenue to the capitol. The Union Station, costing $250,000, the government building, the city hall, the courthouse, the Young Men's Christian Association and the Young Women's Christian Association buildings, the Masonic temple and the Carnegie

MONTGOMERY, ALA.



1 Montgomery County Courthouse
2 A Residential Street in Montgomery
3 Court Square. Exchange Hotel and First National Bank

library are the chief structures in the centre. The capitol dates from 1846; in its grounds is a handsome Confederate monument. There are 86 church societies of all denominations; several of them with handsome, modern edifices. There is a State Normal School for the colored here with 1,500 students, the Montgomery Industrial School for Girls and charitable institutions. Montgomery is the home of the Women's College of Alabama. There are three daily newspapers and several institutional libraries. There are 19 public school buildings, the same provision being made for colored as for white students.

History.— Montgomery was founded in 1817 by Andrew Dexter, of Rhode Island, on the site of the legendary Indian village of Ecunchatty; it was part of the Creek Lands. Dexter named the place New Philadelphia; the situation was tempting, and in 1818 two more settlements were made — East Alabama Town closely adjoining, divided by the present lower Court street (whence the streets on its two sides run from it at different angles), and Alabama Town, a mile or so down the river. On 3 Dec. 1819, the former was consolidated with it as Montgomery, named after the Indian fighter Lemuel Montgomery or the Revolutionary hero Richard Montgomery. The early society was like many pioneer communities, and vigilance committees had to be invoked to restore the reign of the law. The first steamer arrived 22 Oct. 1821; the Montgomery Railroad opened its first 12 miles in 1840. The place received a city charter about 1837; on 22 Jan. 1846 it was made the State capital; the capitol was occupied 1847, burned 1849, replaced by the present, in 1851. Montgomery's interests and central location made it the focus of the secession movement; its position as capital drew in some of the ablest leaders and orators of the South, the famous William L. Yancey (q.v.) being one; and it was made the first capital of the Southern Confederacy, whose government was organized there 4 Feb. 1861. The next year the capital was removed to Richmond; the Union army reoccupied Montgomery 12 April 1865. Alabama was among the first of the States to create a Department of History and Archives, which is located here. This department has a complete record of all State documents since territorial days. It maintains a museum and art gallery.

Population.— The population in 1840 was 2,179; 1850, 6,728; 1860, 8,843; 1870, 10,588; 1880, 16,713: 1890, 21,883; 1900, 30,346; 1910, 38,136. The population in 1920, according to the United States official census, was 43,464. This is an increase of 14 per cent over the 1910 census. About 40 per cent of the population is colored. The city's suburbs have far overspread the official limits.

Bruce Kennedy,
General Secretary, Montgomery Chamber of Commerce.

MONTH, a period of time derived from the motion of the moon. The «sidereal» month may be regarded as the period in which the moon, as seen from a fixed star, would appear to make a complete revolution round the earth; it is evidently the period in which she passes through the 12 signs of the zodiac; its mean value during the year is 27.32166 days. The «synodical» month, more commonly called a «lunar month» or «lunation,» is the period during which the moon goes through all her phases. It is usually reckoned from new moon to new moon; to complete the lunation the moon must not only pass through the 12 signs of the zodiac, but also come again to occupy her old position relatively to the sun, which has itself advanced in the zodiac, hence the lunar is longer than the sidereal month. The mean value of the lunation is 29.5306 days. The «solar» month is the 12th part of one solar year, or 30.4368 days. The «anomalistic» month is the period in which the moon passes from perigee to perigee of her orbit; it differs from the sidereal month because the perigee varies its position. The line of nodes of the moon's orbit varies its position, and the «nodical» month, or the period of her motion from ascending to ascending node, differs from the other months mentioned above. The 12 civil or calendar months of the year have from 28 to 31 days each. The lunar month was used by the Chaldæans and Egyptians, and is still by the Jews, Turks and some uncivilized nations. The calendar months are not equal divisions of the year, some (April, June, September and November) consisting of 30, and the remainder of 31 days, except February, to which a period of only 28 days is assigned (see Leap Year), with the addition every fourth year of one more day. These distinctions often give rise to much confusion as to the time intended to be designated by a month. In popular language it is often understood to be four weeks, as this is very nearly an equal period, expressed in the division by weeks, to the month. This was even laid down by Blackstone as the legal definition of the term, so that a lease for 12 months was only for 48 weeks. The expression of «a twelvemonth,» however, has been legally held to mean a solar year. See Calendar; Moon; Zodiac.

MONTHOLON, Charles Tristan, shärl trēs-täṅ môṅ-tō-lôṅ, Comte (later Marquis) de, French soldier: b. Paris, 21 July 1783; d. 21 Aug. 1853. After service in the navy, he entered the army in 1798, took part in the Napoleonic campaigns in Italy, Austria and Prussia, distinguished himself at Wagram (5–6 July 1809), was made chamberlain (1809), was sent on an important diplomatic mission to the Archduke Ferdinand of Austria (1811) and became general of brigade (1814). During the Hundred Days he was adjutant-general to Napoleon, whom he accompanied in his exile to Saint Helena, and by whom he was appointed one of his executors. Proclaimed chief-of-staff by Prince Louis Napoleon (later Emperor Napoleon III [q.v.]) when the latter landed at Bologne in 1840, he was condemned by the Peers to 20 years' imprisonment, but was liberated after the February revolution (1848). He was elected to the Legislative Assembly in 1849. He published 'Mémoires pour servir à l'Histoire de France sous Napoléon, Ecrits à Sainte Hélène sous sa Dictée' (with Gourgaud 1822–25; 2d ed., 1830), and 'Récits de la Captivité de Napoléon' (1846).

MONTH'S MIND, the requiem mass celebrated in the Roman Catholic churches for the deceased the 30th day after death. The prayers of the mass are the same as those of the requiem mass celebrated on the day of decease or burial except the «Collect,» «Secret» and «Post-Communion.» In the early English church the prayers were offered daily for a month after the person's death. The anniversary of the death is commemorated similarly by the mass called the YEAR'S MIND. Consult ‹Missal›; O'Brien, ‹The Mass›; Sullivan, ‹History of the Mass.›

MONTI, Vincenzo, vēn-chĕnd'zō mŏn'tē, Italian poet: b. Fusignano, near Ravenna, 19 Feb. 1754; d. Milan, 13 Oct. 1828. He was educated in law against his inclination; became secretary to Prince Luigi Braschi; won his literary spur with ‹Saggio di poesie› in 1779; gained speedy popularity with various occasional odes; and in 1787 and 1788 brought out his two great tragedies, ‹Aristodemo› and ‹Galeotto Manfredo,› both in the style of Alfieri. His ‹Basvilliana,› a Dantesque poetic chronicle of recent happenings, notably the massacre of the French envoy Basville by the Roman populace, showed ability to treat a theme in politics; but from the detestation expressed in that poem for the excesses of the Revolution and his appeal to the Austrians against the French, he soon came to the most ardent praise of Napoleon and fled to France to escape punishment from Austria. His panegyric of the mathematician Mascheroni (1801) is largely an attack by the poet upon his personal enemies. (See MASCHERONIANA). After Marengo he returned to Italy and became professor of oratory at Pavia, imperial poet-laureate in Milan, and, after the coronation of Napoleon, historiographer of the Italian kingdom. From that time until the restoration of Austrian rule in Italy, Monti was devoted to Napoleon and wrote numerous odes of victory in his honor. In his latter years, a period of study and adversity, he joined his son-in-law, Giulio Perticari, in his fight with the Della Cruscans, and published his single great work, a version of the ‹Iliad› (1810). His translation of Persius should be mentioned and his most successful drama, ‹Caio Gracco› (1802). Monti was an ardent classicist and in his ‹Sermone sopra la mitologia› (1825) combated romantic tendencies. Consult the biographies and appreciations by A. Monti (1873), Vicchi (1879–87) and Zumbini (1894); and the Milan (1839), or Florence edition (1817) of his works.

MONTICELLI, mŏn-tē-cĕl'lē, **Adolphe,** French painter: b. Marseilles, 1824; d. Marseilles, 1886. He made a short stay in Paris and contributed to the Salon; but, not meeting with success, returned to his native town, where he died poor, ignored and insane. Unappreciated, he sold his pictures in *cafés* for 10 or 20 francs; to-day they bring large sums. Collectors have made fortunes out of the small canvases which have given Monticelli posthumous fame. His ‹Court of the Princess› is in the Metropolitan Museum, New York. «Monticelli,» writes a French critic, «painted landscapes, romantic scenes, still life and *fêtes galantes* in the style of Watteau. One cannot imagine a more inspired sense of color than shown by his works, which seem to be painted with powdered jewels, with powerful harmony, and beyond all else with an unheard of delicacy in the perception of fine shades. There are tones which nobody had ever invented before, and a richness, a profusion, a subtlety which almost vie with the resources of music. The fairyland atmosphere of Monticelli's pictures surrounds a very firm drawing of charming style; but, to use the words of the artist himself, «in the canvases the objects are the decoration, the touches are the scales and the light is the tenor.» Monticelli has created for himself an entirely personal technique, which can only be compared with that of Turner. He painted with a brush so full, fat and rich that some of the details are often modeled in relief, in a substance as precious as enamels, jewels, ceramics — a substance which is a delight in itself. Every picture by Monticelli aroused astonishment. Constructed upon one color, as upon a musical theme, a picture by Monticelli rises to an intensity which one would have thought impossible. His pictures are magnificent bouquets, bursts of joy and color, where nothing is ever crude and where everything is ruled by a supreme sense of harmony.» Consult biographies by Faure (Paris 1908); Gouirand (Paris 1900).

MONTICELLO, mŏn-tē-sĕl'lō, Ark., town, county-seat of Drew County, on the Saint Louis, Iron Mountain and Southern Railroad, about 81 miles south by east of Little Rock. The industries and trade are connected with the lumber, fruit, cotton and grain of the surrounding region, and stock raising is also carried on. Municipal enterprise has installed waterworks, sewage-disposal system and electric lighting. It is the seat of the Hinemon University school, the Arkansas Orphans' Home (Baptist) and of the State agricultural school. Pop. 2,500.

MONTICELLO, Fla., town, county-seat of Jefferson County, on the Seaboard Air Line and Atlantic Coast Line railroads, about 32 miles east by north of Tallahassee. It is in an agricultural section, where the chief products are cotton and fruit, of which it prepares and ships large quantities for northern markets. Pop. (1920) 1,704.

MONTICELLO, Ill., city, county-seat of Piatt County, on the Illinois Central and the Wabash railroads, about 147 miles south by west of Chicago. It is situated in an agricultural and stock-raising region and has attractive high school, library and court buildings. The chief manufactures are foundry and machine-shop products, dairy products, patent medicines, sirups, tile, brick, wagons and carriages. It is the trade centre for a large part of Piatt and the nearby counties, and ships considerable hay, livestock and vegetables. Pop. (1920) 2,280.

MONTICELLO, Ind., town, county-seat of White County, on the Tippecanoe River and on the Chicago, Indianapolis and Louisville and Pittsburgh, Cincinnati, Chicago and Saint Louis railroads, about 75 miles north by west of Indianapolis. The river furnishes good water power for manufacturing. The chief manufacturing establishments are flour and lumber mills and creameries; farming implements, thread, cement and tiles are also manufactured. The town owns and operates the waterworks. Pop. (1920) 2,536.

MONTICELLO, N. Y., village, county-seat of Sullivan County, the terminus of the Port Jervis, Monticello and New York Railroad, about 67 miles northwest of New York city. It is situated in an agricultural region from which large quantities of potatoes, apples and a considerable amount of dairy products are shipped to New York markets. Perfumery, gloves and leather goods are manufactured. The nearby Mongaup Falls furnish ample water power and the village owns its waterworks. The village is a favorite summer resort on account of its pleasant climate and beautiful scenery. A destructive fire in 1909 cost a property loss of $1,000,000. Pop. (1920) 2,330.

MONTICELLO, mŏn-tē-sĕl'lō (It. Little Mountain), Virginia, the estate and residence once owned by Thomas Jefferson (q.v.), third President of the United States. It is in Albemarle County, Va., about two miles from Charlottesville. The estate was an unbroken forest in the early part of the 18th century, until in 1735 the land came into possession of the father of Thomas. Peter Jefferson, the father, and his brother-in-law decided to «go West» and try a new country, so they left the tide-water settlements on the James River and journeyed about 100 miles toward the west, to what is now Albemarle County, and located 20 miles east of the Blue Range and among the foothills of the Southwest Mountains. Peter Jefferson «patented» a tract of land of about 1,000 acres. In looking over his new possession he found no site for a home, such as pleased him; his neighbor, Randolph, sold him from his tract 400 acres for «Henry Weatherbourne's biggest bowl of arrack punch.» The place was then called Shadwell, after Shadwell street in London, and the country around Goochland. Thomas Jefferson was born in the old residence at Shadwell, and this house was his home for 27 years. From his boyhood his favorite spot on the estate was Little Mountain. Often he and his most intimate friend, Dabney Carr, afterward his brother-in-law, ascended the mountain in the twilight, and in the long vacations they studied many an hour under an oak tree, their favorite of the forest. They agreed that whichever one died first, the other would have buried under this tree, and at an early age Dabney Carr was here laid to rest. Later Jefferson, his wife, two daughters, and others of his descendants were buried in the little cemetery which was formed around this oak.

It was when Jefferson was a member of the house of burgesses of Virginia, to which he was elected in 1769, that he began the erection of his residence on the summit of the world-renowned eminence, Monticello. (Jefferson changed the English name to the Italian, Monticello). The Shadwell mansion was on a hill on the north bank of the Rivanna River, and Monticello is south, just where the stream cuts its channel through the outlying range of the Alleghanies, the Southwest Mountains. On the northeast Monticello has a steep rocky base, washed by the Rivanna, on the southwest is a dip of about one-third the height of the mountain which connects it with Carter's, a higher peak. Monticello is still covered by a dense growth of timber, mainly hardwood deciduous trees.

Before the residence on Monticello was completed, the Shadwell mansion was burned down, 1 Feb. 1770. The first building on Monticello was a brick story-and-a-half structure containing one good-sized room and some smaller rooms; it still stands as the south pavilion. Here Jefferson brought his bride in 1772. He was often absent from this beloved home, but his own manuscripts, especially his garden-book, show his love for a quiet domestic life. This same garden-book shows that in 1769 he planted a variety of fruit trees on the southeast slope of the mountain, many of them still in existence. The house was enlarged to suit the needs of the family, and in accordance with the owner's plans. From his European journeys he brought back many new ideas, so that the architecture of the house is somewhat complex. It has the appearance of an Italian villa, with a Greek portico, and considerable of the features of Colonial architecture. The Marquis de Chastellux in a book of travels mentions a visit to Monticello in 1782, and says of Jefferson: «He is the first American who has consulted the fine arts to know how to shelter himself from the weather.» Architecture in America has advanced since that time. Some of the plans, drawn by Jefferson himself, are still in existence. The part of the home that was to last was made of good material and possessed a certain elegance, but the furniture was most simple. His last days saw the estate of Monticello so deeply in debt that it was feared he would have to end his life an exile from his beloved mountain. He sacrificed some of his estate hoping to save the residence and some land for his daughter. His friends assisted him so the estate was not lost to the Jefferson heirs until after his death; it had been his home for 56 years. No debt was allowed to defame the name of Jefferson; Thomas Jefferson Randolph, the grandson, and his daughters paid every dollar of debt their eminent ancestor owed after Monticello had been sold. The great-granddaughters kept a school to assist their father in paying this debt. Ten years after Jefferson's death, Monticello was purchased by U. P. Levy, U. S. N., who bequeathed it to the nation. His will was contested and Jefferson M. Levy, New York congressman, bought off the other heirs, and restored the building and estate to their original condition. In 1923, the Thomas Jefferson Memorial Foundation was incorporated in New York for the purpose of purchasing Monticello and maintaining it throughout all time as a national shrine. A formal contract was made with Jefferson M. Levy, under which Mr. Levy agrees to sell the Monticello estate, the mansion on it, and the Jefferson relics it contains for $500,000. The Foundation at once started to raise a fund of $1,000,000 — half of this amount to be applied to the purchase of Monticello and half to its upkeep.

MONTIGNIES-SUR-SAMBRE, môn'tē'-nyē'sür-sän'br', Belgium, town in the province Hainaut, located on the Sambre 30 miles south of Brussels and on the Lodelinsart-Givet Railway. It is the centre of a coal mining industry and has manufactures of ovens, machinery, steel ware, etc. Its population in 1910 was 21,748.

MONTIJO, môn-tē-zhō, **Eugénie-Marie de.** See EUGÉNIE, EMPRESS OF THE FRENCH.

MONTJOIE SAINT DENIS, môn-zhwä săn dĕn-ē, a French war cry dating from the 12th century. The name is derived from the hill near Paris on which Saint Denis suffered martyrdom.

MONTLOSIER, môṅ'lō'zyā, **François Dominique Reynaud, Count de,** French publicist and politician: b. Clermont, Auvergne, 11 April 1755; d. 9 Dec. 1838. He was elected a member of the States-General (1789) and favored protection of royalty and nobility. He fled (1791) to London where he started an anti-revolutionary paper, the *Courrier de Londres.* In 1800 he was won over by Bonaparte and given a position in the ministry of foreign affairs. He frequently accompanied Napoleon I as political correspondent during his campaigns, but resigned in 1812. After the first Restoration his 'De la monarchie française depuis son établissement jusqu'à nos jours' (Paris 1814) was a work in praise of the feudal state. Under the Restoration he took a prominent place fighting the activities of the Jesuits and published his 'Memoir à consulter' (1826), but in his 'De la crise présente et de celle qui se prépare' (1829) he tries to intermediate between the parties, returning to his early aristocratic views in his 'Mémoires sur la Révolution française, le Consulat, l'Empire et la Restauration' (1829). He defended the Louis Philippe government and was created a peer.

MONTLUÇON, France, town in the Department of Allier, located on the Cher, starting point of the Berry Canal and junction of the Orleans Railway. It consists of the old town with its 15th century castle, and the modern industrial section which has been built up since the opening up of the coal field of Commentry. It possesses a lyceum, commercial court, chambers of agriculture and manufactures, a library and theatre. Its industries are important and consist chiefly of iron and steel works, glass and mirror factories, chemical products, machinery and considerable trade. In 1911 it had a population of 33,799.

MONTMAGNY, Charles Jacques Huault de, shärl zhäk ü-ōlt dė môṅ-män-yē, French colonial governor; d. France, about 1649. He was Canada's second governor-general, 1636–48, and proved himself a wise and able ruler. The condition of the colony improved under his administration, he defeated the Iroquois and concluded a treaty with them at Three Rivers in 1645; and had begun the subjugation of the Hurons when he was recalled in 1647. Under his rule the Jesuits made extensive explorations and settlements, but though deeply religious Montmagny disapproved of the founding of Montreal, considering it a weakening of the missionary forces.

MONTMARTRE, mōṅ-mär-tr, France, a northern district of Paris, a former suburban village, on a conical hill commanding an extensive view of the metropolis. See Paris.

MONTMÉDY, môṅ'mā-dē, France, capital of the Arrondissement of the same name in the Department of Meuse, located on the river Chiers and the East Railway. It is a fort of the second class and consists of the citadel on a rock 960 feet above sea-level with its old or upper town built in 1235 by Arnoux III, Count of Cas and Chiny, and surrounded by its high walls and tower, and the lower town (Bas-Médy). It was several times taken by the French but always released to the Spaniards until, in 1659, it came permanently under French rule. Louis XIV had Vauban greatly strengthen the fortifications. In 1815 the Prussian and North-German allies besieged and then took the lower town by storm when it capitulated. In 1870 it became a useful railroad centre for the Germans. In the World War it was again captured by the Germans. In 1911 it had a population of 2,774.

MONTMORENCY, môṅ-mō-rŏṅ-sē, **Anne,** Duc de, French soldier: b. Chantilly, 15 March 1492; d. Paris, 11 Nov. 1567. He was a distinguished general in the wars of Francis I, and was taken prisoner at Pavia (1525). In 1538 he was made constable of France, but by a rapid change of fortune was banished the court in 1541 under suspicion of conspiracy. He was restored by Henry II (1547), in 1557 was defeated by the Spaniards and taken prisoner at Saint Quentin, and in 1562 was again captured while commanding against the Huguenots at Dreux. In 1563 he drove the English from Havre, and in 1567 received a fatal wound in the battle against Condé at Saint Denis. Consult 'Life' by Decrue (1885–89).

MONTMORENCY, môṅ'mō-rŏṅ-sē, **Henri,** Duc de, French soldier: b. Chantilly, 30 April 1595; d. Toulouse, 30 Oct. 1632. In 1612 he purchased the viceroyalty of Canada from the Prince of Condé for 11,000 crowns, and was wise enough to retain Champlain in command at Quebec. He wearied, however, of the post, which gave him constant trouble, and in turn sold it. His services against the Huguenots in the civil wars were distinguished, and included a victory over the Duc de Rohan in 1628; but he took part in the insurrection of Gaston of Orleans in 1629, was made prisoner, condemned for treason, and beheaded.

MONTMORENCY, mŏnt-mō-rĕn'sĭ, **Falls of,** Canada, a beautiful cascade near the mouth of the Montmorency River, on the Saint Lawrence River, seven miles below Quebec. The river has an irregular course north and south of about 15 miles, and just above its confluence with the Saint Lawrence falls over a precipice 251 feet high, and 100 feet wide at its crest. The falls are visited by great numbers of tourists, and are utilized to supply the power necessary for the electric and street railway plants of Quebec.

MONTOJO, mŏnt-ō'hō, **Patricio,** Spanish naval officer: b. 1833. He entered the navy when a young man, and at the outbreak of the Spanish-American War was in command of the Spanish fleet in the Pacific. This force was attacked by the American Pacific squadron under Dewey in Manila Bay 1 May 1898. Montojo's flagship, the Reina Christina, was successively engaged by the Olympia, Baltimore, Raleigh and Boston, received 70 shots, which killed 52 men and wounded 150; and finally caught fire. Montojo transferred his flag to a gunboat. In September 1899 he was court-martialed in Madrid, and urged in his defense that the fault of the defeat was the Spanish government's, as it had not given him proper equipment. He was retired without right of promotion.

MONTORO, môṅ-tō'rō, Spain, town in the province of Cordova on the rocky left bank of the Guadalquivir and on the Madrid-Sevilla Railway. It has a beautiful church and a fine bridge built in the 16th century and remains of the ancient Moorish fortifications. Its chief industry is olive oil and cultivation of tropical fruits. Its population in 1910 was 15,144.

MONTORSOLI, Fra Giovanni Angelico da, fra jō-vän′nē än-jĕl′ē-kō dä mŏn-tŏr′sō-lē, Florentine sculptor and architect: b. Montorsoli, 1507; d. Florence, 1563. He was a member of the religious order known as Servites; worked at Genoa, after retiring from that order, and by building the Serra and Doria palaces and adding a chantry and Doria tomb to the church of San Mateo, established his reputation as a sculptor and architect (1525). He was soon afterward engaged as assistant by Michelangelo in his work on the chapel of the Medici at Florence; the statue of Saint Cosmas there is by him. Among his other productions are the fountain in the Cathedral square at Messina (1547); he also designed several chapels in the cathedral there and built the lighthouse.

MONTOUR, mŏn-toor′, **Esther** (called «Queen Esther»), American half-breed Indian of the 18th century. She had French blood in her veins and was supposed to have been a descendant of Count de Frontenac, governor of New France. She married Eghobund, chief of the village of Sheshequin, and her keen intelligence enabled her to completely dominate the Senecas over whom she reigned as «Queen Esther.» She was friendly to a Moravian mission which was located near her village for some years, and accompanied the delegates to various congresses of the Six Nations in Philadelphia, where she was well received among the best people owing to her pleasing manners and beautiful person. In the Wyoming massacre in July 1778 the savage in her nature, however, asserted itself and to avenge the death of her son she deliberately tomahawked 14 prisoners. Consult Cook, ‘General Sullivan's Indian Expedition’ (1887).

MONTPELIER, mŏnt-pēl′yėr, Vt., city, capital of the State, county-seat of Washington County, on the Winooski River, and on the Central Vermont, the Montpelier and White River, and the Montpelier and Burlington railroads, about 38 miles southeast of Burlington. It is situated in a beautiful valley surrounded by hills and in an agricultural region. In the vicinity are valuable granite quarries. The chief industrial establishments are flour, feed and lumber mills, machine shops, hardware, patent medicines, granite works, lathes for turning steel clothes pins and creameries. It controls a large portion of the trade of the surrounding country, and ships considerable farm products, especially hay, maple sugar, apples and potatoes, and also dairy products, poultry, granite and lumber. One of the prominent buildings is the State capitol, a fine granite structure built in the form of a cross, the dome, 124 feet high, surmounted by a statue of agriculture. A marble statue of Ethan Allen is at the entrance, under the portico; large State administration building under construction. Another fine building is Montpelier High School built 1915, also the Heaton Hospital, opened in 1896. The city has public and parish schools, the Washington County Grammar School, the Montpelier Seminary, under the auspices of the Methodist Episcopal Church, the Wood Art Gallery, the State Library, the Washington County Grammar and Montpelier Union School Library, and the seminary library. The Y. M. C. A. is in flourishing condition. The government is administered under a charter of 1900 which provides for a mayor, who holds office one year, and a council. The mayor appoints, subject to the approval of the council, the police; and the council elects the health officer, overseers of the poor, superintendents of streets and water and other officers. The waterworks, owned and operated by the city, were opened in 1884, and now (1913) comprise about 40 miles of mains. The water is brought from Mirror Lake, or Berlin Pond, situated about four and one-half miles southeast of the city. The land which is the town site was chartered in 1781, but the first permanent settlement was made in 1787 by people from Massachusetts. The town was organized in 1791, and in 1805 Montpelier was chosen as capital of the State. It was incorporated as a village in 1855. For 40 years it maintained town, village and school district organizations, until 1894, when it was chartered as a city. Among the noted people who have lived in Montpelier are Admiral George Dewey and Rear-Admiral Charles E. Clark, Joseph A. Deboer, an authority on insurance and loans. Pop. 7,125. Consult Hemenway, ‘Gazeteer of Vermont,’ and ‘History of the Town of Montpelier’; Thompson, ‘History of Montpelier.’

MONTPELLIER, môṅ-pĕl-lē-ā, France, chief town of the department of Hérault, on the Lez, six miles north of the Mediterranean, and 80 miles northwest of Marseilles. It is one of the handsomest towns of the south of France and with its equable climate a favorite tourist and winter resort for invalids. Among its noteworthy features are the Peyrou, a splendid promenade, on which is the Château d'Eau, at the termination of a lofty double-arched aqueduct; the citadel; the cathedral; the Palais-de-Justice; the university buildings, and Porte de Peyrou, a triumphal arch of the Doric order. Montpellier is well equipped with educational and other institutions, and since the 12th century has been famous for its school of medicine, said to have been founded by Arab physicians driven out of Spain. It is now merged in the celebrated University of Montpellier, dating from 1289, which has also «faculties» of law, science and literature, and an average annual attendance of 1,500 students; there is a public library of 130,000 volumes. The botanical garden, begun under Henri IV in 1593, is the oldest in France. Montpellier manufactures cottons, candles, soap, verdigris, chemicals, etc. It carries on an active trade, Cette serving as its harbor. Montpellier dates from the 8th century as a village built around a Benedictine abbey. It was a stronghold of the Huguenots, and suffered much in the religious wars. The edict of Montpellier (20 Oct. 1622) granted the free exercise of their religion to Protestants, and confirmed the Edict of Nantes. The philosopher Comte was one of Montpellier's distinguished sons. Pop. about 80,250.

MONTPENSIER, Anne Marie Louise d'Orleans, än mä-rē loo-ēz dôr-lā-äṅ môṅ-pŏṅ-sē-ā, DUCHESSE DE, French princess, better known as MADEMOISELLE or LA GRANDE MADEMOISELLE: b. Paris, 29 May, 1627; d. there, 5 April 1693. Her father was Gaston d'Orleans, Louis XIII's brother; and her mother was Marie de Bourbon-Montpensier, who died when her daughter was five days old, leaving her the richest princess of Europe. Her wealth, pride and romantic disposition prompted her to a high match. In 1646 she refused the Prince of Wales, later Charles II, and her chance to marry Louis XIV was ruined in 1652, when she sided with Condé for whose protection she had the cannon at the Bastille fired on the royal troops. Upon her return to the court in 1657 she fell in love with Lauzun, a Gascon cavalier, whom Louis refused to let her marry. Lauzun was imprisoned for 10 years, but Mademoiselle seems to have married him secretly, in spite of the king, only to find him a brutal husband; they were separated and her last years were spent in pious devotion. Her ‹Memoirs,› covering the years 1630–88, are particularly valuable for the light they throw upon the history of the Fronde; they are edited by Chêruel (1858). Consult Barine, ‹La Jeunesse de la Grande Mademoiselle 1627–52› (New York 1901); Price, E. C., ‹A Princess of the Old World› (New York 1907).

MONTPENSIER, Antoine Marie Philippe Louis d'Orleans, äṅ-twän mä-rē fē-lēp loo-ē dôr-lä-äṅ, Duc de, French prince and claimant to the Spanish throne: b. Neuilly, 31 July 1824; d. San Lucar, near Seville, 4 Feb. 1890. The fifth son of King Louis Philippe, he studied at the Collège Henri IV, entered the army in 1842, served in Algiers, and in 1846 married the Spanish infanta Maria Luisa Fernanda. After the revolution of 1848 he lived in England and Holland; then settled in Spain, where he received the title of Infante and was made captain-general of the Spanish army; was suspected of a plot against the Crown and was exiled from Spain, returning only after the revolution of 1868. In 1870 he quarreled with the Duke of Seville, also a claimant for the throne, and killed him in a duel. During the reign of King Amadeus (1871–73), Montpensier was exiled to the Baleares; upon his recall in 1873 he sided with Alfonso XII, and married to that prince his daughter, Maria de las Mercedes, who died without issue in 1878, the close of Montpensier's political activity. His eldest daughter married the Comte de Paris, and his only son became the husband of the Infanta Eulalia in 1886.

MONTREAL, Canada, the largest and most important city of the Dominion, and ninth in population among American cities, is in the province of Quebec. It lies on the left or north bank of the Saint Lawrence, at the head of ocean navigation, 985 miles from the Atlantic, 180 miles southwest of Quebec and 420 miles north of New York.

Topography.— Montreal lies in the middle of that great plain which stretches from the Laurentians to the Adirondack Mountains and extends from the sea into the middle of the Continent. The rivers which traverse this plain, the Saint Lawrence and the Ottawa, fall together at the head of the Island of Montreal, which is 32 miles long and 10 miles wide at the broadest part. The city is built upon the southeast side of this island, at a point where the Lachine Rapids make further navigation impossible. It owes its importance to this situation. Immediately behind the city Mount Royal rises to a height of 753 feet above the level of the sea. Upon three sides the mountain ends in a sheer cliff, but toward the west it extends in broken ridges for three miles. Mount Royal gives to the city its character. It was converted into a park by Frederick Law Olmstead, who succeeded admirably in bringing to light its characteristic beauties, by obeying the design which nature had already laid down. By following the terraces a roadway was constructed, devious, but always ascending until after a complete circuit the summit is reached. From the various levels and the different points of outlook a wide and diversified view is obtained. To the south, the White, Green and Adirondack mountains may be descried upon the horizon. In the middle-distance a number of rounded eminences arise from the plain, which are, like Mount Royal itself, the roots of old volcanoes. Villages, Longueuil, Saint Lambert and La Prairie, mark the southern bank of the Saint Lawrence, which at this point is two miles wide. Away to the westward the valley of the Ottawa opens out, and the river, dividing on the Island of Montreal, sends its waters on either side to mingle their dark colors with the blue of the Saint Lawrence. Further to the west Lake Saint Louis is spread out like a sea. The Lachine Canal threads the plain, and upon occasion one may see the leap and sparkle of the Rapids. To the north the Laurentians extend their dark purple irregular masses. Immediately around the mountain and upon its lower terraces lies the city.

Geology.— Fourteen distinct geological formations or horizons have been described within a radius of a few miles from Montreal. Four of these belong to the quaternary or newest system; one is doubtfully but probably referable to the Devonian, one to the Silurian (Upper Silurian of Murchison), seven to the Ordovician (Lower Silurian and Cambro-Silurian of many authors), and the remainder to the Laurentian or part of the great Archæan Complex.

History.— The site of Montreal was first visited by Jacques Cartier in 1535. He landed upon the island and followed an Indian pathway: «And we, being on the road, found it as beaten as it was possible to see, in the most beautiful soil and the fairest plain; oaks as fair as there are in any forests of France, under which all the ground was covered with acorns. . . . And about a league thence, we commenced to find the lands tilled, and fair large fields full of the corn of their lands, which is like Brazil rice, as large, or more, than peas, whereof they live as we do on wheat. And in the midst of these fields is situated and fixed the said town of Hochelaga, near and adjoining a mountain which is in the neighborhood, well tilled and exceeding fertile: therefrom one sees very far. We named that mountain *Mont Royal.*»

The next European to visit the spot was Samuel de Champlain in 1611. He landed at a place which he called Place Royale, a name it still bears. He found «in the middle of the river an island about three quarters of a league in circuit, fit for the building of a good and strong town, and I named it the Isle of Saincte Heleine. The rapids come down into a sort of lake, where there are two or three islands and fine meadow-lands.» By this time all trace of Hochelaga had vanished, leaving only obscure legends of a Huron Helen and of the evil which had been wrought by her.

The founding of the present city dates from 1642 and it was marked by voices and visions and dreams and signs. Its inception is shrouded in mysticism; there was Dauversière who whipped himself with a scourge of small chains; there was Olier who afterward founded the Sulpician Seminary, to whom came a revelation as the choir was chanting *Lumen ad revelationem gentium.* These two men were miraculously brought together in the church of Notre Dame de Paris, and to them in an ecstasy the Virgin appeared. All these things are set forth in the *Relations des Jesuites.*

The proposal was to found at Montreal three communities, one of secular priests, to direct the colonists and convert the Indians; one of nuns to nurse the sick; and one to teach the Faith to children white and red alike. This was at a time when, from the condition of Indian warfare, it was like entering a kennel of wolves. The soldier captain of the expedition of 40 men was Paul de Chomedy Sieur de Maisonneuve, a valiant and sober man of grave demeanor and full of courage. Accompanying the expedition was the devoted Jeanne Mance. Arriving at Quebec they encountered only jealousy and distrust. It was then the leader cried: «I have not come to deliberate but to act; it is my duty and my honour to found a colony at Montreal, and I would go if every tree were an Iroquois.» Upon the 17th of May 1642 this strange expedition arrived at the foot of Saint Mary's current. Maisonneuve sprang ashore on the spot where the Customs House now stands. In the words of the officiating priest, Père Vimont, «tents were pitched, camp-fires were lighted, evening fell and mass was celebrated. Fire-flies caught and imprisoned in a phial upon the altar served as lights.» An altar was raised, and kneeling together the adventurers heard the voice of the priest: «You are a grain of mustard-seed that shall rise and grow till its branches overshadow the earth. You are few but your work is the work of God. His smile is upon you and your children will fill the land.» To trace the trials and growth of the Colony would be to write the romance of Christian chivalry.

As a result of the victory which Wolfe obtained over Montcalm on the Plains of Abraham, Canada fell to the British, and Montreal formally capitulated to General Amherst on 8 Sept. 1760. When the war of the American Revolution broke out, operations were directed against Canada. Montreal yielded to Brigadier-General Wooster, and General Carleton was obliged to withdraw to Quebec. During the winter of 1775–76 the Commissioners of Congress, Benjamin Franklin, Samuel Chase and Charles Carroll, took counsel as to how they might detach Canada from its allegiance to the British Crown, which had lasted only six years. The ecclesiastical authorities, with the astuteness of their race, took the occasion to drive a hard bargain with England, by which their religion and laws were guaranteed to them for ever. To England Canada was, in the mocking words of Voltaire, nothing more than a few acres of snow, and the mother country adopted an easy way out of her difficulties. The Commissioners were outwitted and resorted to force. The expedition, which was sent to Quebec under General Montgomery, received no support on the way, and it was ultimately defeated and its commander slain before the barriers of Quebec.

Monuments, Parks and Public Buildings. — Place d'Armes is a small enclosure surrounded by several noble buildings. The parish church of Notre Dame, with the seminary of the Sulpicians, occupies the southern side. The Bank of Montreal with its classic front faces the church, and upon either hand are large buildings for commercial purposes. The most notable feature of the Place d'Armes is the statue erected in honor of Sieur Chomedy de Maisonneuve, the founder of Montreal. He is represented in bronze, in the costume of the 17th century, holding a fleur-de-lis banner. The granite pedestal shows the inscription: «*Paul de Chomedy de Maisonneuve, Fondateur de Montreal, 1642.*» It rests upon a fountain and displays bas-reliefs representing Maisonneuve killing the Indian chief; the founding of Ville-Marie; the death of Lambert Closse defending his enclosure near Saint Lambert Hill; the heroic death of Dollard, who fell with his companions at the Long-Sault on the Ottawa, and saved the colony. At the four corners are life-size bronze figures, representing an Indian, a colonist, with the legendary dog Pilote, a soldier and Jeanne Mance, all finely done by Philip Hébert, the Canadian sculptor.

Jacques Cartier Square fronts the river and is adorned with a column and statue of Lord Nelson, erected in 1808, and recently restored. Into this square the traffic from Bonsecours market overflows, and it has lost all the dignity of a public place. At the head of this square Frontenac burned four Iroquois in 1696, with good effect upon the tribe.

Victoria Square is in the centre of the city, at the foot of Beaver Hall Hill, and contains a good bronze statue of Queen Victoria, of colossal proportions, by Marshall Wood. A monument to King Edward VII adorns Phillips Square.

Dominion Square occupies the site of an old cemetery. The square is a pleasant place and acquires dignity from the buildings on either side; the Canadian Pacific Depot, the Windsor Hotel and on the east the cathedral of Saint James. Here have been erected the ice palaces when Carnival was king. Near the centre of the square is a structure containing a figure in bronze of the late Sir John A. Macdonald. The figure itself is of commanding proportions with a reasonable degree of harmony in its parts, but the canopy with its obscure adornments and trifling decorations, disguises the value of the figure.

Saint Helen's Island, at the foot of the current, is a small island called by the name of Helen, wife of Champlain, the first European woman to visit Canada. The English government acquired it from the Barons of Longueuil for a military depot and station. There is yet upon the island a battery of guns and barracks. The place is prettily wooded and has many secluded spots.

Churches.— The Catholic cathedral of Saint James has an imposing situation upon Dominion Square. It is erroneously called the cathedral of Saint Peter, because it is a reproduction of Saint Peter's at Rome, modified to suit the exigencies of the Canadian climate;

for example, the roof is sloping to throw off the snow. This noble edifice was projected by the late Archbishop Bourget in 1852, when his church and palace on Saint Denis street were consumed in the great fire of that year. The work was commenced in 1868 and is now nearly finished. Apart from the plan the exterior is hard and gloomy in appearance. The dome is a noble adornment and a salient feature in the architecture of Montreal. Its height with the cross is 250 feet and its diameter 90 feet. The plan is cruciform after the manner of its prototype, the tribune and ends of the transept being rounded. The total length is 330 feet, the breadth of the transept 225 feet, the height to the roof-tree 80 feet. The interior is upon the model of the Italian churches. At the north entrance is a statue to the founder by Hébert.

The parish church of Notre Dame faces the Place d'Armes. It is a plain stately edifice of late Gothic style, built of graystone in 1824, by James O'Donnell. The present site was occupied by a church built in 1672, a long low structure with a pointed roof. Notre Dame is one of the largest churches in America, being 255 feet long and 134 feet wide, and capable of containing 18,000 persons. There are two towers, 227 feet high provided with an elevator, and from the summit a notable view may be obtained. They contain a chime of 10 bells which are rung upon special occasions. There are three others, one «le Gros Bourdon,» the largest bell in America, weighing 15 tons. The interior is florid and tasteless in its decorations, but the wood carving is good. The organ was built at Saint Hyacinthe in 1890. Behind the choir is a richly adorned Lady Chapel.

Adjoining the church is the seminary of Saint Sulpice, erected in 1710 and now used for the offices of the Order. As in the days of Charlevoix, it is «a stately great and pleasant house, built of free-stone, after the model of that of Saint Sulpice at Paris; and the altar stands by itself, just like that at Paris.»

Notre-Dame-de-Lourdes, on Saint Catherine street, is the only church in Canada in which all the interior decoration is meant to illustrate one central idea; in this case, the dogma of the Immaculate Conception. M. Bourassa, the artist, was stimulated to this effect by the declaration in 1854, of Pius IX, that this dogma was of faith. The style of architecture is Byzantine and Renaissance in harmonious proportions. Within and without the effect is one of unity and force.

Notre Dame-de-Bonsecours dates from 1673, when it was founded by Marguerite Bourgeois. The present edifice dates from 1771, and several times has been in danger of being swept away by the tide of commerce at its base. It has been sorely mishandled by the renovator.

The church of the Gesu on Bleury street, with Saint Mary's College adjoining, is the abode of the Jesuits. They returned to Canada in 1847, and erected the present church in 1864. Members of this Order were the first to establish missions in Canada, and an account of their trials affords the most romantic reading of its history. Individual priests penetrated the wilderness and lived and died often in hideous torment amongst the savages of the Iroquois confederacy. At the time of the conquest they were expelled from Canada, and their estates confiscated. Up to 1892 their revenues were devoted to educational purposes when, under arrangements, their estates were restored to the Order. The church is 194 feet long, 96 feet wide, the transept 144 feet and the nave 95 feet high. The frescoes are in grisaille, grayish tints imitative of bas-reliefs — a very effective decoration for the interior. The evening music is very fine, and an admirable sermon in English is often preached which attracts many non-adherents of the Roman communion.

Amongst the churches of Montreal the Anglican Christ Church Cathedral holds first place in correctness of style. The style chosen is early English. The architect has insisted very clearly upon its proportion and symmetry, and has succeeded in erecting one of the most important architectural units in America. Its conception is due to Bishop Fulford, the first resident bishop of Montreal, and his memorial on the east side is much admired. It resembles the Martyrs' Memorial at Oxford. The church is in the form of a Latin cross. The total length is 212 feet, transept 100 feet, height of spire 224 feet, nave 67 feet. The material of which it is built is Montreal limestone faced with Caen sandstone, which, though soft for the climate, has weathered to a very delicate tone of color. There is no attempt at interior decoration, except in the staining of the glass, which is well done, especially the northern windows and those of the transept. Other features are the seats of the choir, and the capitals of the columns carved to imitate Canadian flowering plants. The chapter-house, an octagonal building with broken outlines, adds to the general effect. In spite of, or perhaps by reason of, the correctness of the design and the adherence to it, the edifice somehow lacks the true cathedral feeling.

Saint George's Church, Anglican, on Dominion Square, is a very dainty piece of building, after the manner of the 13th century Gothic. One notes the following features: the stone porch, the spire 230 feet high, with a fine chime of bells, the wide span of the roof, and the freedom of the nave from pillars. The church was erected in 1870, of limestone and olive sandstone.

The church of Saint James the Apostle, on Saint Catherine Street West, is a pleasing little edifice. It contains a chime of six bells which ring with good effect. One admires the pulpit church was erected in 1870, of limestone and the stalls of carved buttonwood.

The principal Presbyterian churches are Saint Andrews (Church of Scotland) on Beaver Hall Hill; Saint Paul's, Knox, American, and Crescent on Dorchester street; and, most important, Erskine Church, on Sherbrooke street.

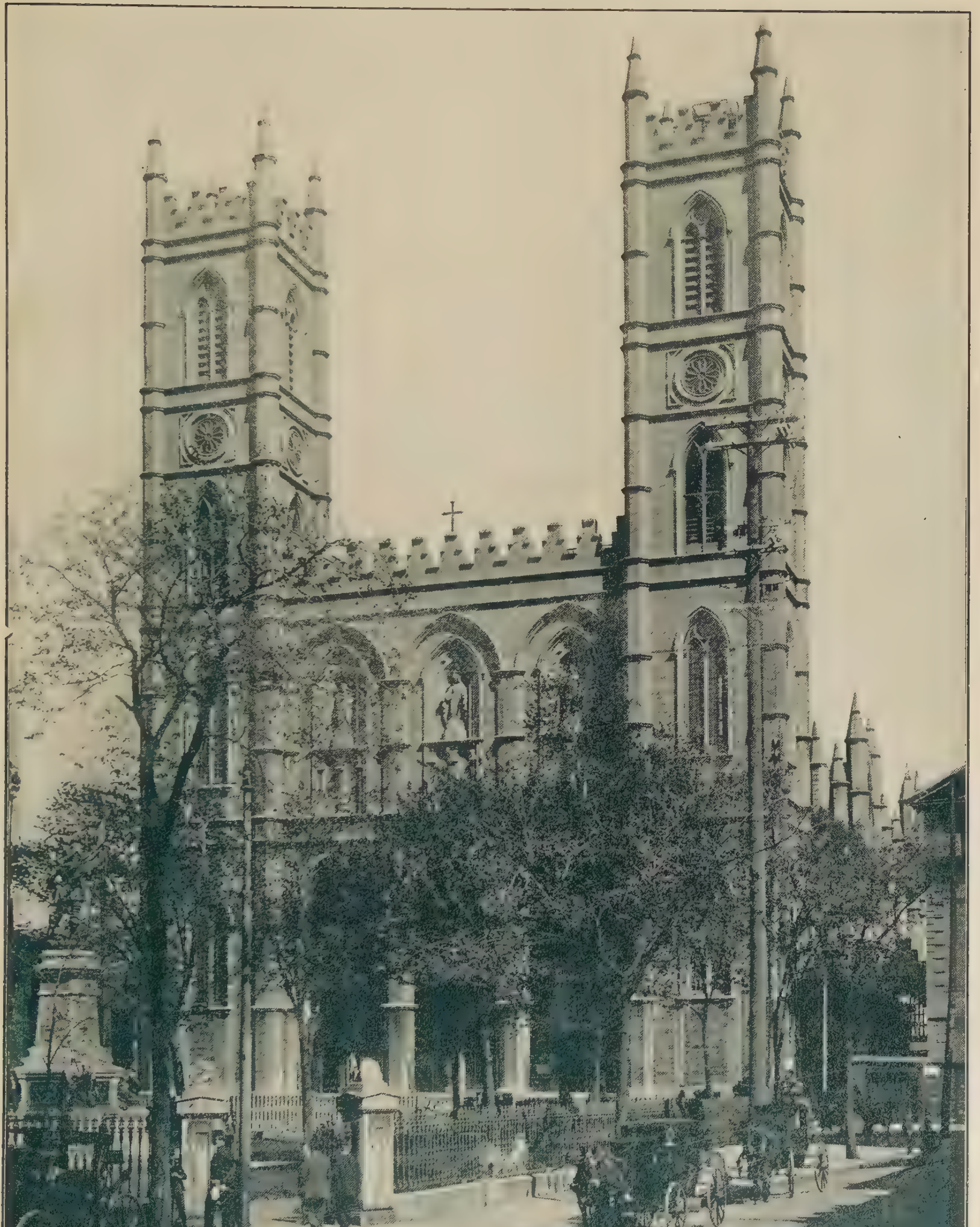
Saint James is the chief of the Methodist churches. It is situated on Saint Catherine street; it is elaborate in design and within the arrangement is of a very modern kind.

Educational Institutions.— McGill University, non-denominational, was founded in 1821, when James McGill, a native of Glasgow, born 1744, died 1813, under a will dated 1811 bequeathed £30,000 to the Royal Institution for the Advancement of Learning. This corporate body dates from 1801 and it secured a new charter in 1821, but it was not till 1829 that educational work was undertaken. McGill University contains four faculties, Arts, Law, MONTREAL, CANADA

City of Montreal from Mount Royal

Dominion Square

MONTREAL, CANADA



Notre Dame Church

Medicine and Applied Science, the Royal Victoria College for Women and a Conservatorium of Music. In 1917–18 the enrolment was 1,040; about 2,300 students and graduates were serving in the Great War.

The university library, a fine Romanesque building, erected in 1893, contains over 150,000 volumes. It is particularly strong in history. The museum, erected in 1882, is rich in geological collections. The observatory is the centre of much valuable work in astronomy. Connected with the university are the Presbyterian, Wesleyan, Anglican, Diocesan and Congregational colleges. There is also in Montreal the Medical Faculty of Bishop's College, Lennoxville.

Laval University was founded in 1852 by the Quebec Seminary, which itself was founded in 1663 by Mgr. de Laval Montmorency, the first bishop of Quebec. Laval operates under a royal charter signed at Westminster 8 Dec. 1852 and under the bull, *Inter Varias Sollicitudines,* promulgated by the Sovereign Pontiff Pius IX, 15 April 1876. In conformity with the decision of the Propaganda a branch of Laval University was established in Montreal in 1877, enjoying all the privileges of the mother university at Quebec. A new building which is a modern adaptation of the Renaissance was erected on Saint Denis street out of the large funds of the seminary. The first floor is occupied by the law faculty, the second by the faculty of medicine. This faculty was formed by an amalgamation in 1891 with the Montreal School of Medicine and Surgery, founded in 1843. In 1919 this branch became the independent University of Montreal.

The Seminary of Saint Sulpice undertakes the theological teaching for the Montreal branch of Laval University, and a portion of the work in arts. Its buildings extend from Sherbrooke street up the slope of the mountain and include the grand seminary and the Seminary of Philosophy. There are more than 450 students in residence with 28 professors. Two towers, the remains of the fort constructed in 1671, still stand in front of the seminary.

Saint Mary's College is conducted by the Jesuits and adjoins the church of the Gesu on Bleury street. Here 400 students are assembled and receive an excellent training in classics.

The Sisters of the Congregation of Notre Dame was established in 1653. These sisters have 91 educational establishments in Canada and the United States with 1,000 nuns and over 30,000 pupils. The mother house, Villa Maria, was burned in 1895, but it is now being replaced on a new site.

The Sisters of the Holy Names of Jesus and Mary inhabit the Hochelaga Convent for a mother house. They have 36 minor houses in which 10,000 children are taught.

Hospitals.— The Hotel Dieu, 253 beds, founded in 1643, occupies a pile of buildings erected in 1859. During the Iroquois Wars and ever since this hospital has done good service. It is attended by the surgeons of Laval. The Montreal General Hospital (484 beds) was founded in 1819, and opened in 1822. The Royal Victoria Hospital (355 beds) was founded, erected and endowed between 1888 and 1893 by Lord Strathcona and Mount Royal and Baron Mount-Stephen. Other hospitals are the Notre Dame, with 148 beds, which is now erecting new buildings with accommodation for contagious cases, the Western General Hospital and the enormous hospital of the *Soeurs Grises* for foundlings and the aged infirm. The «Alexandra Hospital» for contagious diseases was erected by the Protestant community at a cost of $200,000.

Other public buildings are the city-hall, an imitation of the Hotel de Ville in Paris; the courthouse, in a classical style with a dome; the Art Gallery, with some good pictures but not equaling those held in private collections; the Fraser public and reference library with accommodation for 300,000 volumes, opened by Field Marshal Joffre on 1 September; the Canadian Pacific Railway Station, a fine castellated structure. Many of the private residences are fine, and the general material of construction being gray limestone gives to the city an appearance of dignity.

Navigation and Trade.— The Montreal-Quebec channel, with a minimum depth of 31 feet, accommodates vessels of 15,000 tons, and the port handles one-third of Canada's commerce. Montreal has eight miles of deep water in the harbor, and it is well equipped for the expeditious handling of traffic. Port statistics for 1917 show 6,921 arrivals, of which 579 were Atlantic ships, 68 from the Maritime Provinces and 6,274 from inland waters (gross tonnage, 5,217,309 tons). The total value of the imports for year to 31 March 1916, $129,139,817, and of the exports of Canadian products, $173,436,739. The customs receipts for 1917 were $37,857,723, and the inland revenue receipts, $15,685,451.

Banking and Finance.— Montreal is the banking centre for Canada. There are 20 chartered banks in Canada, many of which have their head offices in Montreal and nearly all have branches. The bank clearings in Montreal for 1917 were $4,188,255,210; the assessment valuation was $824,630,229 (doubled in six years). The municipal budget, $14,230,492 in 1916, is the highest in Canada.

Railways.— Three great railway systems, the Grand Trunk, Canadian Pacific and Grand Trunk Pacific, have their headquarters in Montreal with general offices and large works. Two bridges span the Saint Lawrence. The Victoria bridge, one and three-fourths miles long, tubular, costing $6,300,000, was designed by Robert Stephenson, and the work was inaugurated by the Prince of Wales in 1860. It was long regarded as one of the engineering feats of the world, but in 1898 it was converted into a structure more suitable for modern needs with two tracks, a driveway and foot-path. The Canadian Pacific Railway bridge, light and graceful, crosses the river at Lachine. It is built on the cantilever principle, and has two spans each 408 feet long. In order to obtain terminal facilities for the Canadian Northern Railway, a tunnel has been constructed through Mount Royal.

Population.— The population of Greater Montreal is (Dominion Census 1921) 607,063. In the city 75 per cent of the population are of French-Canadian extraction. Both French and English languages are officially recognized and the majority of the population speak both languages. In 1800 the city had 7,000 population. Montreal has the largest birth rate of any of the world's large cities, being in 1915

36.96, the death rate was 19.60; but infant mortality is heavy, 185 per 1,000.

Schools.— The public schools are controlled by boards of commissioners, one for Catholics and one for Protestants. These are elected by the legislature and the city council. The schools are in the main effective, though the commissioners are chiefly clergymen, and education is free. The city was placed under government by commission in 1918.

Climate.— The weather in Montreal is cold in winter and pleasantly warm in summer. The greatest cold, however, is rarely below 20° zero, and the greatest heat above 88°. The annual mean temperature is about 42°. There is generally plenty of snowfall in winter and sleighing begins about 1 December. Consult Bosworth ‘Hochelaga Depicta’ (new ed. 1901); Dawson's ‘Handbook’ (1888); Hinshelwood, ‘Montreal and Vicinity’ (1904); Brumath, ‘Histoire populaire de Montréal’ (1890).

ANDREW MACPHAIL.

MONTREAL, Capture of, in American Revolution. See QUEBEC, BATTLE OF.

MONTREAL, University of. See LAVAL UNIVERSITY.

MONTREUIL, mȯṅ'trẹ'y', France, town in the arrondissement Sceaux and department of Seine, five miles east of Paris and north of Vincennes. It has a church dating from the 12th–14th century. The place is noted for its remarkably fine fruit especially its cherry orchards. It has manufactures of chemicals, India-rubber goods, dolls, pianos, porcelain and art furniture. Its population, approximately, 43,217.

MONTREUX, mȯṅ'trẹ, Switzerland, invalid resort in the canton of Vaud, located on Lake Geneva and on the Geneva-Saint-Maurice line of the Simplon Railway. It consists of several villages scattered on the cliffs and lake shore, among them Vernex (the capital), Clarens, Territet, Veytaux, Glion, etc. In 1910 the communities numbered 18,800 souls. On account of its lovely scenery and mild and healthy climate the year round it is greatly frequented by invalids and convalescents. The ancient noted castle of Chillon is in the neighborhood. A rack-and-pinion railway takes visitors from Glion up to the Rochers de Naye, 5,800 feet above sea-level. Consult Gribble, F. H., ‘Montreux’ (New York 1908); Bührer, C., ‘Le climat de Montreux’ (Montreux 1902).

MONTROSE, mŏn-trōz', **James Graham,** MARQUIS OF, Scotch Royalist general: b. 1612; d. Edinburgh, 21 May 1650. He was son of the Earl of Montrose, whom he succeeded in that title in 1626. He was educated at Saint Andrew's; joined the opposition to Charles I's attempt to introduce episcopacy into Scotland in 1637, becoming one of the leaders of the Covenant. In 1638–39 he three times overran Aberdeen. In the latter year he was an envoy to the king at Berwick; in 1640 he was the first to cross the Tweed in the Scottish invasion of England. In 1641, being found in secret correspondence with the king, he was imprisoned by Argyll for five months. In the following year he was offered the command of the Covenanting army, but declined; and in the following year definitely turned to the Royalist side. In 1644 he left Oxford disguised as a groom and penetrated to Blair Atholl. He then united the western clans, united by their common hatred of Argyll against the Covenanters, and with them he won several victories — at Tippermuir, Aberdeen, Inverlochy, Auldearn, Alford and Kilsyth — only to be crushed at Philiphaugh (12 September) by David Leslie. Montrose escaped to Norway. In 1649 he succeeded in urging the younger Charles to send him again to Scotland, raised an army at Gottenburg, landed at Orkney, was defeated at Carbisdale in Southerlandshire and afterward was captured, taken to Edinburgh and there drawn and quartered. His loyalty to the Stuart cause is only less remarkable than his own scheme of Scottish independence of ecclesiastical control, an ideal to which he always remained faithful. Montrose was a political poet, whose verse is vigorous. As a general he ranks first among the Scottish Royalists. Consult Buchan, John, ‘The Marquis of Montrose’ (London 1913); Gardiner, ‘The Great Civil War’ (Vol. II, which is particularly able in its criticism of Montrose's strategy); Mowbray, Morris, ‘Montrose’ (in the ‘English Men of Action’ series, London 1892); and Napier, ‘Montrose and the Covenanters’ (ib. 1838).

MONTROSE, Colo., town, county-seat of Montrose County, on the Uncompahgre River, and on two branches of the Denver and Rio Grande railroad, about 355 miles southwest of Denver. It is in the Uncompahgre Valley, in which there is a large acreage of fertile soil, which is made productive by irrigation. The chief products are fruit, grains and vegetables. The three local banks have combined resources amounting to $1,586,830. The assessed property valuation is $3,002,320, on a real value estimated at $5,000,000. The town's principal public buildings are the courthouse, city hall, library, fire house, and pump station. The annual revenues are about $160,000. There are two graded schools and a county high school. Considerable attention is given to stock-raising. The government is on the commission-manager plan. Pop. (1920) 3,581.

MONTROSE, Pa., borough, county-seat of Susquehanna County, on the Montrose, the Lehigh Valley, and the Delaware, Lackawanna and Western railroads; also on the Scranton and Binghamton Electric Railroad; about 40 miles north by west of Scranton. It is about 2,000 feet above the sea, and its cool climate in summer and the beauty of its scenery make it a favorite summer resort. The value of taxable property is about $400,000 on a basis of 33 per cent valuation. The tax rate is about 5 per cent. The manufactories are machine shops, lumber mills, flour mills and creameries. The public buildings include the county courthouse, jail and the public library. The government is of the regular borough pattern common in Pennsylvania. Pop. (1920) 1,661.

MONTROSE, Scotland, a seaport town and royal burgh in Forfarshire, 90 miles northeast of Edinburgh by rail, at the mouth of the South Esk, which widens out into a shallow expanse behind the town, known as Montrose Basin. The river is crossed by a suspension bridge, and by a railway bridge. Montrose is well built and has the usual public buildings and institutions, including two public libraries and one of the largest parish churches in Scotland. It has one of the best golf links in Scotland. The principal employment is flax-spinning. Boat building is also carried on. There are extensive saw-mills, and a large ærodrome nearby. The foreign trade is largely in timber, flax, etc. Montrose is also the centre of a fishery-district. It dates from the 10th century. Pop. 12,666. Consult Mitchell, ‘History of Montrose’ (Montrose 1866).

MONTROYDITE. A mineral, oxide of mercury, HgO in ore mined in the Terlingua district, Texas.

MONTS, Pierre du Guast, pē-ār dü gä môṅ, French colonist in North America: b. Saintonge, France, about 1560; d. Paris, 1611. He was of an Italian family and educated in the Roman Catholic faith, but became a Protestant, fought on the Protestant side in the wars of religion, and was made governor of Pons in Saintonge. He made several voyages to America, and is believed to have accompanied Chauvin's expedition of 1600. In 1603 he was appointed lieutenant-general with viceregal authority of a company of colonists to whom Acadia had been granted, a territory which included the present maritime provinces of Canada, and part of the province of Quebec and the greater part of New England. He sailed from Havre in 1604 with Samuel Champlain and the colonists, and after exploring the Bay of Fundy discovered Annapolis Basin, which they called Port Royal, and then explored and named Saint John River. He established a colony at Saint Croix and at Port Royal and then returned to France, but his patent for colonization was canceled in 1607, and afterward renewed for a year. At his own expense he sent relief to his colonists and assisted Champlain and Pontgrave to make a voyage to the Saint Lawrence in 1607; and Quebec was founded by explorers aided by him in 1608. He lost favor at court upon the death of Henry IV. The date of his death is uncertain. Consult Lescarbot, ‘History of New France’ in the Champlain Society's edition, edited by Grant and Biggar (3 vols., Toronto, 1907–14); Parkman, ‘Pioneers of France in the New World’ (1865); and ‘Tercentenary of De Monts' Settlement at Saint Croix Island’ (Maine Historical Society's publications, Portland 1905).

MONTSERRAT, mōnt-sĕr-rät', Spain, a deeply eroded mountain 4,070 feet high in the province of Catalonia, 30 miles northwest of Barcelona, famous for its ancient Benedictine monastery, composed, in part, of 13 hermitages, accessible only by steps hewn out of the steep rock, and founded by Sifredo el Vellaso, count of Barcelona, on the spot where a miracle-working image of the Virgin Mary was found in the 9th century. It was enlarged and richly endowed by Philip II. Learned Benedictines had established themselves here as early as 976; and they and their successors formed a large library, which was destroyed when the monastery was pillaged by the French and partly destroyed in 1811. After the restoration of Ferdinand VII the rebuilding of the monastery was begun, but was stopped again when the monks were expelled by the Carlists in 1827. The monastery has fallen more and more into decay since the abolition of the order to which it belonged. While living in this monastery Ignatius of Loyola (q.v.) conceived the idea of founding the order of Jesuits. According to legend Montserrat was the site of the castle of the Holy Grail.

MONTSERRAT, mŏnt-sĕ-răt', West Indies, a British island of the Leeward group, almost at the same distance (about 30 miles) from the islands of Nevis, Antigua and Guadeloupe. It is 32 square miles in extent, nearly two-thirds of which is mountainous and barren. Its culminating point is the Souffrière, a volcano 3,000 feet high. The climate is on the whole healthful. The principal exports are sugar, molasses, tamarinds and lime-juice, and the principal imports, cottons and clothing materials, hardware and other manufactures. Revenue (1915–16), £10,722; expenditure, £11,969; imports, £33,686; exports, £43,141. The government of the island is vested in the governor-in-chief of the Leeward Islands, who is represented by a commissioner, assisted by a nominated executive and legislative council. Plymouth, the capital (pop. 1,500), is on the southwest side of the island. The island was discovered by Columbus and was colonized by the British in 1632. It was twice in the hands of the French, but since 1783 has been uninterruptedly possessed by the British. Pop. 12,215, of whom not more than 200 are whites.

MONTT, mōnt, **Jorge,** Chilian sailor and politician: b. Santiago, Chile, 1846. He was a son of the Chilean statesman Manuel Montt (q.v.) and early entered the navy, where he had gained the rank of captain when in 1890 an uprising against President Balmaceda was threatened. When the revolution broke out in 1891 Montt was given command of the naval and land forces subject to the control of Congress, and after the suicide of President Balmaceda was appointed provisional President and in November 1891 was elected to the office. His moderate and conciliatory administration did much to heal the wounds of war; he reformed the currency, reorganized the navy and army and made the municipalities locally autonomous.

MONTT, Manuel, Chilian statesman: b. Petorca, Chile, 5 Sept. 1809; d. Santiago, Chile, 20 Sept. 1880. He was graduated from the National Institute in Santiago and was engaged as instructor there until he entered upon his political career. As assistant secretary of state he sternly suppressed the revolt of 1837, and in 1838 was made a judge of the Supreme Court. His election to the chamber of deputies followed and he was for a time president of that body. He was Minister of Justice 1841–45 and of the Interior 1846–48, was elected President in 1851 and under his firm, conservative policy a succession of revolts were crushed, many industrial improvements were introduced and the laws reorganized and codified. After the expiration of his second term he resigned his office to his successor and assumed the presidency of the Supreme Court. He was president of the American Congress which met in Lima in 1865.

MONTUCLA, mòṅ'tü'klạ', **Jean Étienne,** French mathematician: b. Lyons, 5 Sept. 1725; d. Versailles, 18 Dec. 1799. He was surveyor-in-chief of the royal buildings in Paris (1766–92). He wrote ‘Histoire des recherches sur la quadrature du cercle, etc.’ (2d ed, Paris

1831); ‹Histoire des mathematiques› (ib. 1758, 2 vols.; 2d ed., 1799–1802, 4 vols.), the first and most important work on the scientific history of mathematics up to the time of Moritz Cantor (1860).

MONTYON (môṅ-tē-ôṅ) **PRIZES,** rewards from a fund left in charge of the French Academy by Jean Baptiste Robert Auger, Baron de Montyon (b. 1733; d. 1820), a French economist and philanthropist and a friend of Franklin. He founded in his lifetime six prizes, of which two, that for useful discoveries in the arts, and that for valuable medical discoveries, lapsed after his death. The others are (1) a prize, founded in 1782, granted annually to the author of a literary work adjudged the most beneficial to the temporal good of mankind; (2) founded in the same year, for the most important discovery making more healthful the occupations of workingmen; (3) founded in 1783, to promote mechanical research, and (4) a prize, first given in 1783, for the most heroic act on the part of any poor French citizen. For each of these prizes he left a capital fund of 10,000 francs ($2,000).

MONUMENTA GERMANIÆ HISTORICA, a great historical work dealing with the monuments and antiquities of Germany, the first volume of which was published in 1826. It was begun in 1819 and later was placed under the direction of the Prussian Academy of Sciences. In 1914 upward of 114 volumes had been issued.

MONUMENTAL INTERIOR DECORATION. See INTERIOR DECORATION.

MONUMENTS. The term monument is applied to structures which are characteristic or remarkable on account of their being erected as memorials, and also, though loosely, to those buildings which express some form of worship, or have peculiar prominence on account of their beauty, proportion or grandeur. In modern times, churches are often erected as memorials to individuals, and yet the term monument is not applied to them except in the vague general sense named above. It is evident, therefore, that such buildings may be commemorative monuments, as well as columns or tombs. Sepulchral monuments are the memorials most commonly erected. In Egypt, pyramids are monumental on account of their size, showing very little of so-called architectural art. There are about 100 of these, each containing a room which was used as a royal sepulchre. The Great Pyramid built by Khu-fu, called by the Greeks, Cheops, about 950 B.C., measures 764 feet square at its base and is 482 feet high. As Saint Peter's, at Rome, is about 15 feet less in height, it could be covered by the shell of this pyramid. In Assyria and Chaldæa there are few temples and no tombs remaining of sufficient architectural importance to be classed as monuments. Important buildings in these countries were placed on huge mounds or terraces of earth, which raised them above the surrounding country, but as these structures were mainly of unburned bricks, they have fallen into shapeless mounds.

The earliest existing Greek monuments are found at Mycenæ and Tiryns. The Lion Gate at Mycenæ shows two large lions rampant on each side of a column, carved in bas-relief above the lintel; and this sculpture is wholly monumental in character, related both to religious and dynastic associations. The gateway at Mycenæ is one of the earliest of porches or towers of entrance which were among the chief monuments of Greek art: these were the Propylæa of which the most important was that of the Acropolis of Athens, with the small Ionic temple of Nike Apteros close by. The choragic monument erected by Lysicrates to commemorate his choral victory may still be seen at Athens. This was built at the time of Alexander's conquest, when Athens was declining and Asia Minor was being filled with magnificent temples of the Corinthian order. Other choragic monuments still exist at Athens in a partly ruined condition. The Tower of Winds, or Clepsydra of Andronicus, was erected at Athens about 100 B.C., but this was rather a utilitarian structure, as it served as a measure of time. Other Greek monuments were the Arch of Hadrian, of the later Roman period; entrances to other temple sites, similar to the Propylæa of the Acropolis, as that of Eleusis; theatres, colonnades, stadia and gymnasia. Greek tombs that remain at the present time are nearly all to be found in Asia Minor, the best known being the Mausoleum at Halicarnassus. The small Greek monuments and tombstones are very simple and refined in detail. Of the same epoch are the rock-cut tombs of Asia Minor. Some of these are of great beauty, the exterior face of the living rock having been smoothed and made vertical, and adorned with magnificent bas-reliefs of very large size.

The principal Roman monuments were on a large scale, the rough work being executed by cheap labor, soldiers, barbarians or slaves. The Roman Forum was crowded with temples, arches and individual memorials. Arches were characteristic products of Roman civilization and were generally erected in honor of some victorious general or in commemoration of some great event.

Columns were also frequently erected. The column of Trajan is still standing in Rome. It is 133 feet high and has a spiral line of figures in relief from the foot to the top of the shaft, showing the story of one of Trajan's campaigns. There is a staircase within the column leading to the top. The sepulchral monuments of the Romans were generally small. One of the larger ones was the circular tomb of Hadrian, now the castle of San Angelo. Small sepulchral monuments lined the sides of Roman roads for miles outside the city. Many have been found at Pompeii. The tomb of Cæcilia Metella, a characteristic example, was built by Crassus, about 60 B.C. It was circular in plan, with a square base.

Early Christian architecture, developing after the fall of Rome, used or copied Roman buildings. At Ravenna interesting monuments of this period were the tomb of Galla Placidia, built in the middle of the 5th century, and the tomb of Theodoric, erected early in the 6th century, a two-storied structure, roofed by a single stone 36 feet in diameter. Basilicas commemorating scenes in the life of Christ were erected as early as the 4th century in Syria, at Bethlehem, at the sepulchre near Jerusalem and on the site of the temple.

The principal monumental buildings of the Byzantine period were in Syria, where from the

4th to the 8th century what we call Syrian architecture was in full luxuriance. The noble tombs of cut stone are, together with the churches and villas built of the same material, rather Græco-Syrian than strictly Byzantine in construction and design. Romanesque architecture in western Europe has not left us many monuments of great size and importance, but some tombs of great beauty remain in the churches of England, France and Germany.

Prominent monuments of the Gothic period were erected in the cathedrals at Paris, Chartres, Rouen, Amiens, Rheims and in the Sainte Chapelle, Paris. In England, early English Gothic is well shown in the crowd of altar-tombs, some of them with canopies, which are found in the churches, especially in Westminster Abbey. Memorial chapels were also built of great richness and splendor. A good example of the decorative period is to be found in Henry VII's chapel at Westminster. Italian Gothic monuments include many of the wall-tombs in the cathedrals at Florence, Sienna and Milan.

The Renaissance is represented by the Florentine wall-tombs of Santa Croce and the Venetian ones of the churches of Saints Giovanni e Paolo, the Frari and many others. The principal monument of Saracenic architecture in India is the Taj Mahal in India, built in the middle of the 16th century, but the tomb-mosques of the caliphs near Cairo are equally fine as architecture, however inferior in cost and splendor.

In the 19th century, a list of monuments should certainly include the triumphal arches of the French empire, the arch of the Carrousel and the Arc de l'Etoile, the Pantheon, the Madeleine, the Colonne Juillet; the Siegesthor in Munich and the Brandenburger Thor in Berlin; in America, the tomb of General Grant in New York, the many Lincoln and Washington monuments in different cities, and a host of statues, some equestrian, for which see SCULPTURE.

Bibliography.— Bartlett, ‘About Monuments’ (1878); Bartoli, ‘Veteres arcvs Avgvstorvm trivmphis insignes ex reliqviis qvæ Romæ adhvc svpersvnt’ (1824); Benvenuti, ‘Monumenti sepolcrali della Toscana’ (1819); Boussard, ‘Etudes sur l'art funéraire moderne dans ses conceptions les plus pratiques, chapelles, sarcophages,’ etc. (1870); Brindley, ‘Ancient Sepulchral Monuments to the End of the 18th Century’; Chancellor, ‘Ancient Sepulchral Monuments of Essex’ (1890); Clochar, ‘Monumens et tombeaux méasurés et dessinés en Italie’; Conze, ‘Die attischen Grabreliefs’ (1890–92); Gardner, ‘Sculptured Tombs of Hellas’ (1896); King, ‘Roman Sculpture’ (1907); Macklin, ‘Monumental Brasses’ (1890); Tatham, ‘Etchings of Grecian and Roman Architectural Ornament’ (1826); Thompson, S., ‘Sepulchral Monuments of Italy’ (1883); Walters, ‘Art of the Greeks’ (1906); id., ‘Art of the Romans’ (1911); Ware, ‘The Memorial Hall of Harvard University’ (1887); Wasmuth, ‘Monumente und Standbilder’ (1891–1901).

MONVEL, Louis Maurice Boutet de, loo-ē mō-rēs boo-tā dė môṅ-vĕl, French painter and illustrator: b. Orleans, 1850; d. 16 March 1913. He studied with Rudder, Cabanal and Carolus Duran, with the last, after some work in the Atelier Julien. His first picture exhibited in the Salon appeared in 1874. He prefers the decorative to the realistic effect in color and modeling. The illustrations which he made for the ‘Life of Jeanne d'Arc’ (1897) in the *Century Magazine* are supremely successful both in line and color. In the Memorial Church at Domrémy he has painted six panels illustrating the career of La Pucelle. Among his best-known pictures is ‘The Apotheosis’ (1885) and his portraits are famous.

MONYPENNY, William Flavelle, English journalist: b. 1866; d. 23 Nov. 1912. He joined the staff of the London *Times* in 1893, and in 1899, shortly before the outbreak of the South African War, became editor of the *Johannesburg Star*. Under his direction the *Star* had strongly advocated the cause of the Uitlanders against the Kruger régime. The Boer President ordered his arrest, but Monypenny escaped in female garb and joined the Imperial Light Horse. He went through the siege of Ladysmith and after the war returned to his editorial duties in Johannesburg. He disapproved of the Chinese Labor Ordnance and resigned, returning to England in 1903. He was there appointed to write the authoritative ‘Life’ of Disraeli, but died before the work was completed. It was carried on by Mr. George E. Buckle, retired editor of *The Times*.

MONZA, mōn'zä, Italy, a town of Lombardy, in the province of Milan, 11 miles by rail northeast of Milan, on the Lambro. The town is of great antiquity and has a quiet, venerable air. The most remarkable edifice is the cathedral of Saint John the Baptist, originally founded at the end of the 6th century by the celebrated Lombard queen, Theodalinda, but subsequently renovated and enlarged. It contains the iron crown of Lombardy, which according to tradition was beaten out of one of the nails used at the Crucifixion and which was restored to the Italians by Austria in October 1866, as well as various other relics and some valuable art treasures. There is also an old imperial palace surrounded by a large and well-laid-out park. It has been a residence and the place of coronation of the kings of Lombardy for 900 years. Here, while on a visit, King Humbert of Italy was assassinated 29 July 1900. It has a technical school, a lyceum and gymnasium and there are manufactures of silk, hats, leather, bricks, tiles and sausages, for which the town has long been famous. Pop. 53,214.

MONZONITE. An igneous rock of granular texture often quarried and sold as «granite» which it closely resembles. In mineral composition, however, it is intermediate between syenite and diorite; both alkali feldspars (or orthoclase) and lime-soda feldspar (or plagioclase) being present in approximately equal amounts.

MOODY, Agnes Mary (Claypole), American biologist: b. Bristol, England, 1 Jan. 1870. She graduated (1892) at Buchtel College, Akron, Ohio, then studied at Cornell, taking the degree M.S. in 1894 and obtaining (1896) the degree of Ph.D. at the University of Chicago. She taught two years at Wellesley College and two years at Cornell, being the first woman to teach in laboratory and recitation courses required of all students. She assisted her father at Throop Polytechnic Institute, taking charge of the department on his death (1903). She wrote ‘Embryology of Anurida Maritima’ which appeared in the *Journal of Morphology* (1898).

MOODY, Dwight Lyman, American evangelist: b. Northfield, Mass., 5 Feb. 1837; d. there, 22 Dec. 1899. He worked for a time on a farm, then went to Boston as a salesman in a shoe store, and while there became a member of a Congregational church. He later obtained a position in a shore store in Chicago and there began his active religious work in the Sunday school by forming a class of poor boys; from this beginning he built up a large Sunday school and after 1860 devoted himself entirely to religious work. During the Civil War he worked among the soldiers in the employ of the Christian Commission and at the close of the war resumed his mission work in Chicago, becoming president of the Young Men's Christian Association in 1865. A large church was built for his work, of which he became pastor, though never regularly ordained. In 1870 he was joined by Ira D. Sankey, the singer, and in 1873 the two visited England and Scotland, where, in spite of their American methods, they were the instruments in a great religious awakening that had not been paralleled since the days of Whitefield and Wesley. On their return large meetings were held in New York, Brooklyn and Philadelphia, and subsequently in many cities throughout the United States, at which it is estimated Mr. Moody addressed over 50,000,000 people. Without abandoning entirely his evangelistic tours, he made Northfield his headquarters and established there a girls' academy (1879) and a training school for religious workers, and at Mount Hermon a boys' academy. Later he founded a school for Bible study in Chicago; and inaugurated the custom of holding, at Northfield, summer conferences of college students and missionary volunteers, and the annual meetings of the Young Men's and Young Women's Christian associations. He also established systematic preaching and distribution of religious literature among inmates of the prisons; and built up at Chicago and Northfield establishments for the publishing of inexpensive religious books, tracts, etc. His marked executive ability won him the confidence of men of wealth, who gave generously to his enterprises. Though a Bible student, he was not a theologian and did not understand the methods of Higher Criticism; he was primarily a preacher of the Word of God as he believed it. The power of his preaching was due to his strong personality, his simplicity of thought and language, and his thorough sincerity and earnestness. In conjunction with his colleague, Mr. Sankey, he surrendered the great profits on their ‘Sacred Songs and Solos’ to public purposes. He published ‘How to Study the Bible’; ‘Men of the Bible’; ‘Weighed and Wanting’; ‘Arrows and Anecdotes’ (1877); ‘The Way and the Word’ (1877); ‘Heaven’ (1880); ‘Secret Power’ (1881); ‘The Way to God’ (1884); and ‘Bible Characters’ (1888). Consult Drummond, ‘Impressions of Dwight L. Moody’; Hartzler, ‘Moody in Chicago’; Moody, W. L., ‘Life of D. L. Moody’ (1900); and Moody, P. D., and Fitt, A. P., ‘Shorter Life of D. L. Moody.’

MOODY, James, American soldier: b. New Jersey, 1744; d. Sissibou, Nova Scotia, 3 April 1809. He was a New Jersey farmer at the outbreak of the American Revolution, but with 73 of his neighbors joined the British forces and was active in attacks upon his former friends. He was daring and unscrupulous in his movements and succeeded, in 1781, in seizing important despatches of Washington's; he was captured and imprisoned at West Point, but made his escape. Though unsuccessful in many instances, his knowledge of the country enabled him to make his escape after his expeditions as a spy and his name was regarded with fear in the region in which he worked. He went to England after the war, and then to Canada where he was presented with an estate and received half-pay as colonel of the militia during the remainder of his life. His adventures are recorded in his ‘Lieutenant James Moody's Narrative of his Exertions and Sufferings in the Cause of Government since the Year 1776’ (1783).

MOODY, John, American financial writer: b. Jersey City, N. J., 2 May 1868. He was engaged in newspaper work until 1890, then entered the service of Spencer Trask and Company, bankers, rising from office boy to manager (1890–1900). He founded (1900) *Moody's Manual of Railroads and Corporation Securities* and was its editor till 1907. In 1905 he founded *Moody's Magazine,* an investor's monthly, and (1909) *Moody's Analysis of Investments,* both of which he edited. He also wrote ‘The Truth about the Trusts’ (1904); ‘The Art of Wall Street Investing’ (1906); ‘The Investor's Primer’ (1907); ‘Masters of Capital in America’ (1911); ‘How to Invest Money Wisely’ (1912).

MOODY, William Henry, American lawyer and statesman: b. Newbury, Mass., 23 Dec. 1853; d. 2 July 1917. He was graduated from Harvard in 1876; studied law and began the practice of his profession in Haverhill, Mass. He quickly attained success as a lawyer, was city solicitor for a time, and from 1890 to 1895 district attorney for the eastern district of Massachusetts. In this position he showed himself an active, fearless prosecuting officer, notably in the case of certain aldermen of the city of Lawrence whom he brought to punishment for receiving bribes; he was also associated with the Massachusetts attorney-general as prosecuting attorney in the trial of Lizzie Borden for the murder of her parents. In 1895 he was unanimously nominated for Congress by the Republicans, to fill a vacancy; he was elected at that time and also to the three succeeding Congresses. Through close study of the rules of the House he became distinguished as a parliamentarian and was suggested as a possible candidate for speaker; he was a most active and efficient member of the committee on appropriations and regularly had charge of the Sundry Civil Appropriations Bill, which he examined in detail; he was also appointed to the committee on insular affairs and through his work on both these committees gained special knowledge of naval matters. In 1902 he was appointed Secretary of the Navy to succeed John D. Long (q.v.), in 1904 he became Attorney-General and on 17 Dec. 1906 became an associate justice of the Supreme Court of the United States, resigning in ill-health in 1910.

MOODY, William Vaughan, American poet; b. Spencer, Ind., 3 July 1869; d. 17 Oct. 1910. He was graduated from Harvard in 1893, where he was for a time an instructor in English and afterward an assistant professor in English literature in the University of Chicago. He published ‹The Masque of Judgment› (1900); ‹Poems› (1901); and, with R. R. Lovett, a ‹History of English Literature› (1902); ‹The Fire Bringer› (1904); and the dramas, ‹The Great Divide› and ‹The Faith Healer› (1909). His verse is well wrought, not infrequently rising to a sustained high level as in his ‹Ode in Time of Hesitation.› See FAITH HEALER, THE; GREAT DIVIDE, THE.

MOON, William, English philanthropist: b. Horsemonden, Kent, 1818; d. England, 1894. He was educated for the Church but was compelled to abandon this career upon becoming totally blind. He devoted his life to establishing schools and educational helps for blind children and invented a new and simple system of embossed letters for the use of the blind. He established libraries of his books in Europe and United States and greatly furthered the facilities for home instruction. Consult Rutherford, ‹William Moon and His Work for the Blind› (1898).

MOON, The, from the earliest times, has been the chief object in the sky to attract the attention of the human race. The continual change in its appearance from day to day, its value as a light giver at night, the apparent irregularity of its motions, the curious markings on its face, its connection with the ebb and flow of the ocean, and many a real or supposed influence in terrestrial affairs, have always caused it to be a subject of speculation and inquiry among philosophers of every age. Yet it is only within the last 300 years that the various theories and superstitions connected with it have been put to the test, and that order has been evolved from the chaos of fact and fancy. Even at the present time many a belief, tested by science and found wanting, finds support in otherwise enlightened communities.

Size, Weight, etc.— The moon is a nearly spherical body with a diameter of 2,163 miles, a little more than a quarter of that of the earth, moving at an average distance from the earth of 239,000 miles. Its surface is therefore 1/13 and its volume 1/49 that of the earth. It is, however, less dense in the ratio of 10 to 16, or, on the average, its density is the same as that of the rocks on the earth's surface, so that it would require the materials contained in 81 moons to form our globe. Its smaller size and mass cause gravity at the surface to be only 1/6 of the terrestrial attraction: the same exertion which would lift a given weight here would raise a weight six times as great there, and a body, instead of falling 16 feet in the first second, would fall only 2⅔ feet. It moves so as to always turn the same face to the earth and therefore rotates on its axis in the same time that it takes to go round the earth — about 27 days. The rotation of the moon about its axis and its motion round the earth is neither quite uniform or circular, as will be seen later; consequently extra portions of the eastern and western faces come successively into view. Further, the moon's axis is not quite perpendicular to the plane of its orbit, so that the north and south caps are in turn a little inclined toward the earth. These motions are called the librations of the moon, and they permit us to see rather more than half (about three-fifths) the surface.

Light and Atmosphere.— Like the earth, the moon possesses no light of its own, but receives all from the sun, and its day — the interval from sunrise to sunrise — is a month. At full moon it sends to us about one 600,000th part of that given by the midday sun. The surface is not nearly so white as its concentrated light would seem to indicate; its brightest portions are nearly of the shade of salt and its darkest that of slate, the average being the color of gray weathered sandstone. The long sunshine for two weeks and the absence of sun for the following two weeks must cause immense variations of temperature. But Professor Langley of Washington estimates that the temperature of the surface, even at the hottest, probably never rises above the freezing point of water; the heat is radiated out nearly as fast as it is received. In the long night the temperature must fall to something like 200° below zero. In spite of this small amount of heat, Professor Langley, by inventing a very sensitive instrument called a bolometer which would detect the heat from a candle a mile away, succeeded in detecting heat rays coming from the moon. His results depend partly on the many fruitless attempts which have been made to find evidences of the existence of an atmosphere. If air is present its pressure cannot exceed 1-750 that at the earth's surface and it is probably much less, as no refraction has ever been observed when the moon's limb passes over a star. A similar argument applies to the existence of water in any quantity, and no clouds have been certainly seen. It is possible that water — probably in the form of ice — may exist at the bottom of some of the deeper craters, but the low temperature would scarcely permit it to be liquified even when the sun was shining full on it.

Surface Marks.— The well-known resemblance of the full moon to a human face disappears almost immediately if a glass — even the smallest opera glass — is trained on to it. When it is looked at through a moderately large telescope, the surface is seen to be broken up into mountain ranges and valleys as well as darker portions, which seem to be comparatively flat. A closer inspection made at more favorable times when the moon is not full so that the shadows cast by the sun can be well seen, puts these features clearly into view. The magnificent telescope in the Lick Observatory in California brings the satellite so near that objects which might be seen with the naked eye if the moon were only 100 miles distant, can be distinguished on the surface under favorable circumstances.

Craters.— The most marked feature of the lunar surface is the number of craters which appear in almost every region. These are circular rings with diameters ranging from half a mile to 100 miles, and with exterior walls sometimes as high as 20,000 feet — formations comparatively rare on the earth's surface where they seldom exceed a diameter of a very few miles with much lower walls. In some parts they are scattered in the wildest profusion, overlapping one another, smaller ones breaking into the walls of the larger and so crowded together that it is difficult to distinguish one from another. In many cases there is a central cone or a group of peaks which often rise as high as the walls of the ring and on which small craters can sometimes be seen. There are also lofty ranges of mountains ten to fifteen thousand feet high, some peaks of the Lunar Appenines rising to 20,000 feet.

Seas.— The so-called seas of the moon are simply portions of the surface darker in color than the average and very much less broken up by craters or mountain ranges. These form the main features of the face seen at full moon. They are crossed by thin lines known as rills or clefts which run in all directions, sometimes straight and unbroken for hundreds of miles, even intersecting ranges of mountains and craters and reappearing on the other side. These rills are generally two and rarely exceed 10 miles in width, their depth varying from 100 yards up. A curious feature of a different kind is an absolutely straight cut — the great Alpine valley — some 83 miles long, which crosses a range of mountains and under low magnification looks as if some wandering celestial body had grazed the surface.

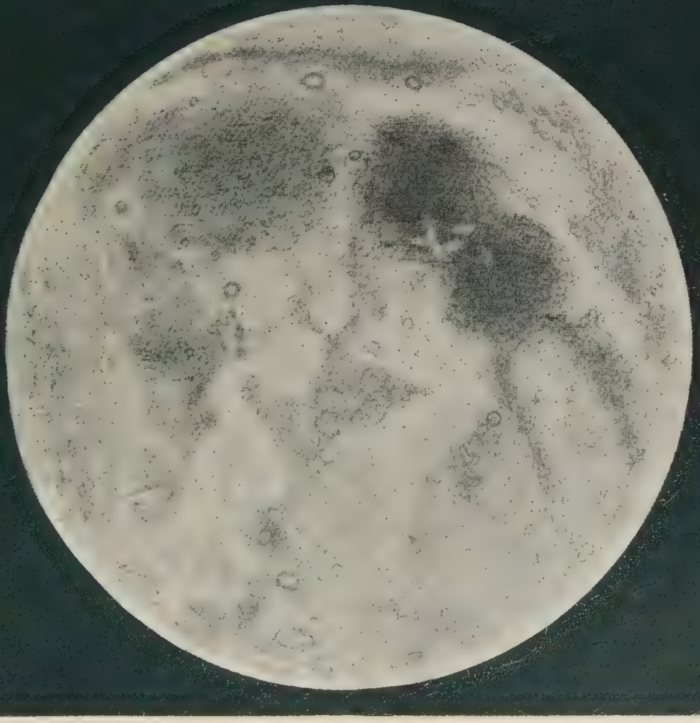
White Rays.— The most puzzling feature of the surface consists in a series of white rays or streaks which radiate from a few of the principal craters in every direction. In their brightness they mask all other shades of tint on the surface and seem to continue their course, sometimes for hundreds of miles, quite independently of the nature of the country they cross. Prof. W. H. Pickering, however, who has studied the systems carefully, considers that their actual length has been much exaggerated and believes that the apparent length is due to lines of small craters from which they emerge. The most remarkable system is that starting from the crater Tycho, itself of a brilliant whiteness, and giving the whole region the appearance of a globe cracked by internal pressure — a suggestion made by Nasmyth who actually cracked a glass globe in this way and obtained a striking resemblance.

Origin of the Formations.— The origin of these various formations has been the object of much speculation. That the craters and mountain ranges came into existence after the cooling down of the outer crust and were produced by its contraction and by the enormous tidal disturbances caused by the earth seems a sufficiently probable hypothesis. Objection has been raised to this view on account of the fact that terrestrial volcanoes all show the presence of large quantities of water and that the earth has comparatively few of such formations. But weathering action has undoubtedly had little effect on the moon's surface, while it has been a powerful factor in eliminating such features on the earth. Another theory, that the craters are of the nature of cracked bubbles like those which appear in cooling slag which contains gases, does not require the presence of water, but it has not met with any general acceptance. The rills or clefts are unexplained; some astronomers incline to the idea that they are dried watercourses, others with greater probability that they are fissures produced in cooling. The white streaks or rays are considered by Messieurs Loewy and Puiseux, whose work on the moon accompanies a big atlas of photographs taken lately at Paris, to be formed of volcanic dust or cinders shot out from the craters and carried for considerable distances by currents of air before being deposited on the ground. Prof. W. H. Pickering inclines to the same theory. The rays were the last evidences of activity before the body of the moon became cold and absorbed the small quantities of air and water which at one time were present outside.

Surface Changes.— The evidence as to changes in the moon's surface since the first careful observations were made — about a century ago — is doubtful. One crater, Linné, observed by Beer and Mädler, is given as having a diameter of about six miles. At various times it seems to have appeared and disappeared again — possibly owing to the different circumstances under which it was seen; at present it is scarcely visible. In the absence of air and water such changes must be very rare, the weathering action which takes place on the earth having little or no effect; possibly the enormous differences of temperature every two weeks may in time cause a breaking up of the rock.

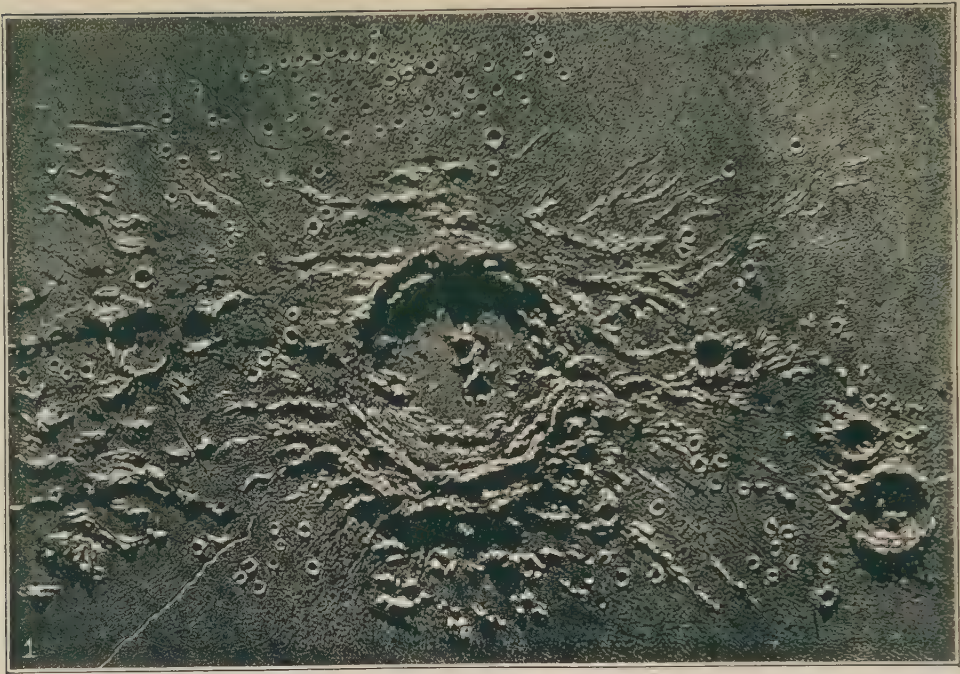
Photographs.— The photography of the moon's surface was started by Draper and Bond in America about the middle of the 19th century. The pictures of the latter were shown at the London Exhibition in 1851 and inspired De la Rue in England and others as to its possibilities for the accurate investigation of the lunar surface. The magnificent photographs of Rutherfurd made in New York and published in 1873 have only recently been surpassed by those taken at the Lick, Yerkes and Paris observatories. It is possible that photographs taken 20 or more years from now may, on comparison with these, enable astronomers to detect changes if such occur. The varying aspects of the moon will make this difficult, but the personal element, always present when drawings have to be made, will at any rate be eliminated. At the same time the eye can detect minute details which are absent from photographs.

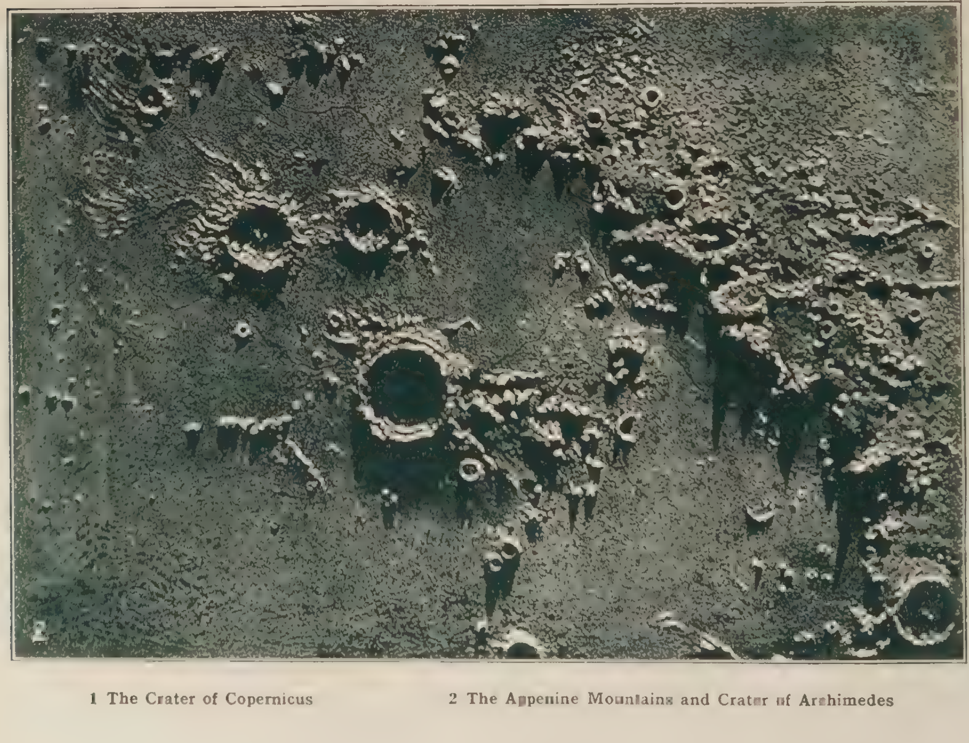
Periods.— The average time occupied by the moon, in moving in its orbit round the earth, is 27d. 7h. 43m., its sidereal period. The synodic period is the interval between successive new moons and it is a little longer owing to the time, 365¼ days, occupied by the earth in moving round the sun. The moon performs 1/27⅓ of its orbit and the earth 1/365¼ each day, and therefore the difference between these 1/27⅓ — 1/365¼ = 1/29½ is the daily fraction of its path which the moon describes with respect to the sun; that is, 29½ days (29d. 12h. 44m.) is the synodic period. If the plane of the moon's orbit coincided with that of the earth's equator, the moon would rise about 50 minutes later each day, but the inclination of these planes to one another varies between 18° and 29½°, so that this retardation is quite different at different times. When full moon occurs near the autumnal equinox, it may, in the latitude of New York, be as small as 23 minutes, while further north it may reduce to nothing, so that for several nights the full moon rises about the same time, soon after sunset. The feature is known as the harvest moon and in countries where the autumn weather is very uncertain, it is a valu-



1 The Moon, 15 days old, photographed by Ritchie at the Yerkes Observatory (Natural or naked eye view)
2 General Map of the Full Moon, showing the location of the Craters and of the Maria (as seen by the naked eye)

SURFACE OF THE MOON

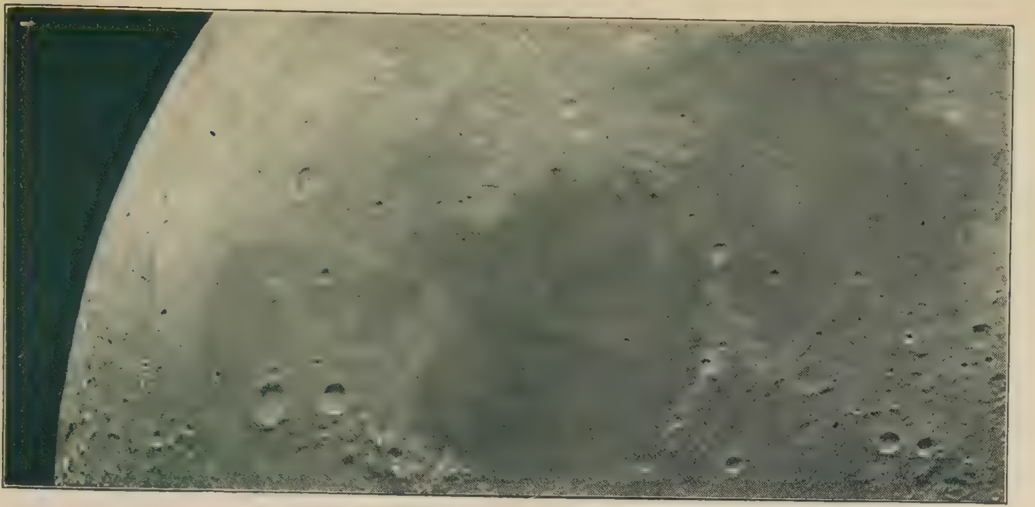


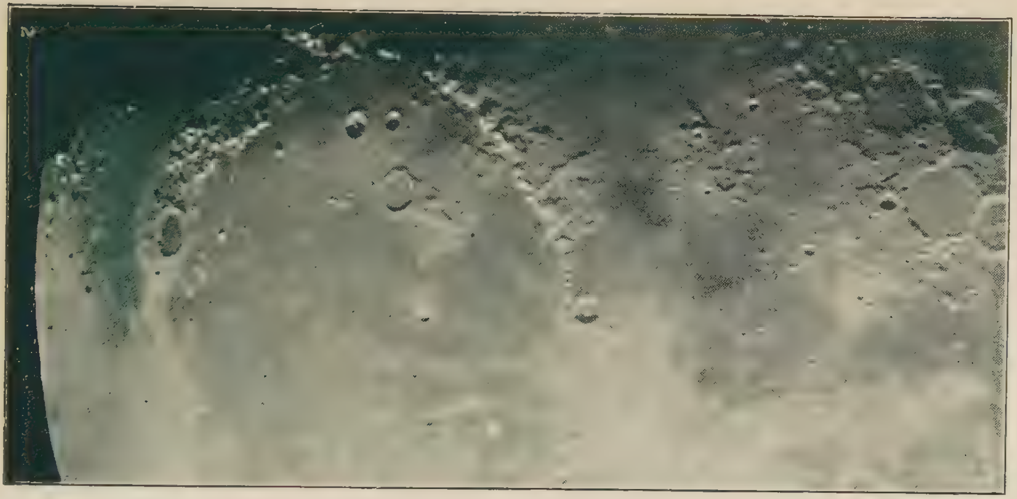


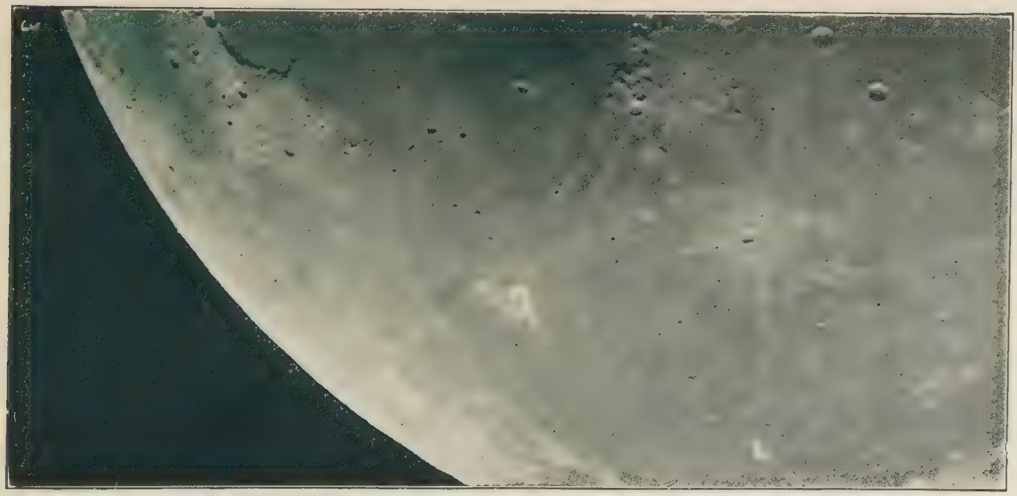
1 The Crater of Copernicus 2 The Appenine Mountains and Crater of Archimedes

PART OF THE HARVARD PHOTOGRAPHIC ATLAS OF THE MOON

Showing Some of the More Prominent Craters



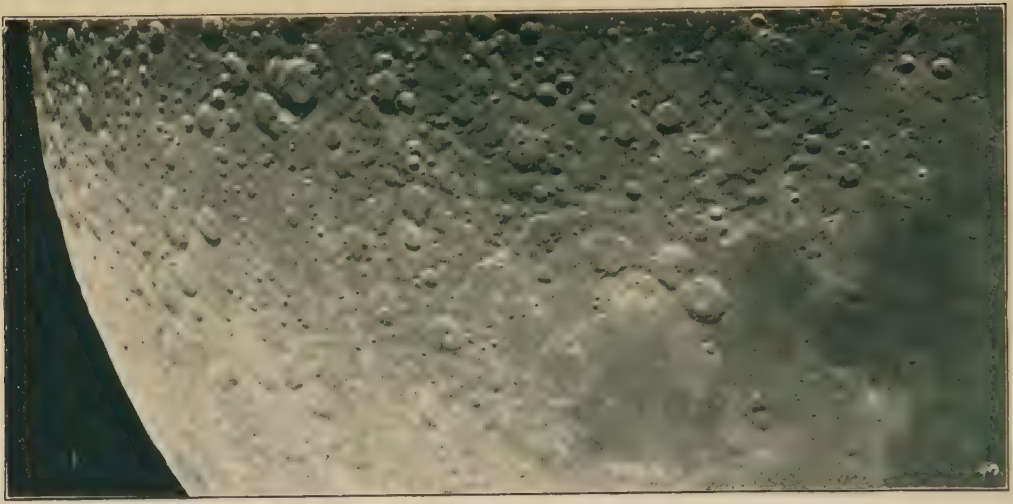


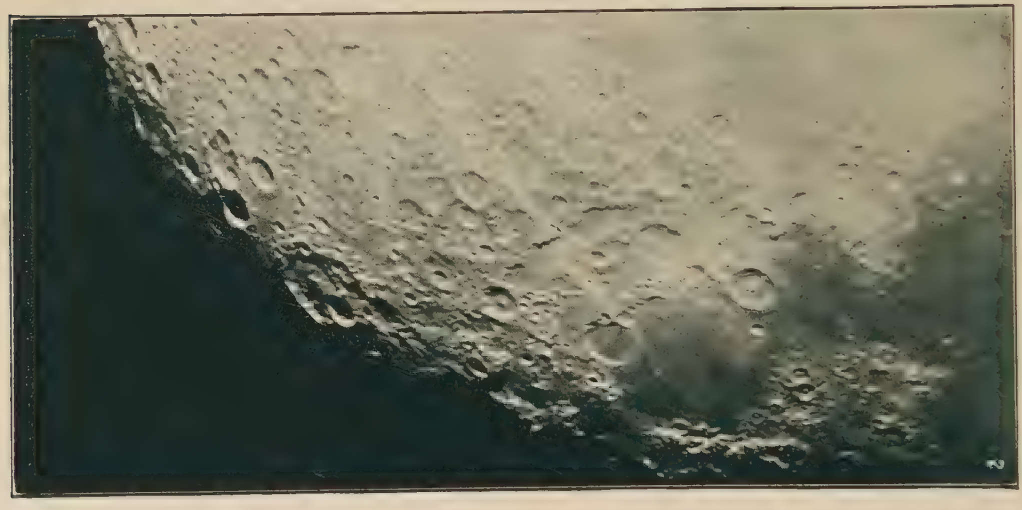


1 Mare Tranquillitatis. Mare Serenitatis 2 Mare Imbrium. Plato 3 Kepler. Aristarchus

PART OF THE HARVARD PHOTOGRAPHIC ATLAS OF THE

Showing Some of the More Prominent Craters





1 The Full Moon   2 Piccolomini. Theophilus   3 Piccolomini. Theophilus

able help to the farmers, furnishing them with light to get in their crops after the setting of the sun. The hunter's moon is the next full moon after the harvest moon; the same phenomenon, less marked, occurs. The anomalistic month, a little over 27½ days, is the interval between the times when the moon is in its perigee, that is, when it is nearest to the earth.

Moon's Path.— The shape of the moon's path is approximately an ellipse whose two axes are nearly of equal length, but an ellipse will only represent its orbit for a very short time. In order to give an idea of its complicated motions, a model, on a scale of 1:125,000,000, can be constructed as follows: The first part, to represent the motion of the earth, consists of a rail on raised supports (which are movable) in the shape of an ellipse whose semi-axes are respectively 390 feet 10 inches and 390 feet 3 inches long and whose plane we shall for convenience take to be horizontal. The earth is represented by a carriage moving on this rail and the sun by a ball placed on the longest diameter, distance 6 feet 7 inches from the centre of the ellipse. A straight bar two feet long is attached to the carriage by a ball and socket joint at a point ⅔ inch from the centre of the bar. The bar forms the longest diameter of an elastic tube in the shape of an ellipse and the tube is so attached to the bar that it may change its size and shape slightly. The plane of the tube is to be inclined about 5° to the horizontal. A bead sliding freely within the tube represents the moon.

Motion.— Now let the carriage run along the rail not quite uniformly but so that its angular velocity about the ball representing the sun varies inversely as the square of its distance from the ball, and it makes it a complete circuit once in 365¼ days. At the same time the plane of the tube attached to the carriage is to turn round slowly in the opposite direction, so that the horizontal line in it (that formed by the intersection of the plane of the tube with the horizontal plane and called the line of nodes) will describe a circuit once in 18⅔ years; the inclination of the tube is to oscillate not more than 5′ on either side of the mean inclination of 5° 8′ to the horizontal. With these motions, the bar carrying the tube is to slowly turn round in its own plane in a forward direction so as to complete a circuit once in about nine years, and the tube is to slightly change its shape and size to and fro as it moves, finally, the bead representing the moon moves according to the same law and in the same direction as the carriage, that is, not quite uniformly, but so that its angular velocity about the joint varies inversely as the square of its distance from the joint; its circuit in the tube is completed once in 27.5546 days — the anomalistic period. These various motions, complicated as they are, only give a general idea of the way in which the moon moves, but the model is sufficient to explain most of the phenomena connected with the moon's motion. All the parts are in a state of oscillation about their average positions, the periods varying from a few days to many thousand years. Even the plane, size, shape and position of the rail are not quite constant but vary slowly from year to year. The attempt to disentangle even the principal oscillations had become an almost hopeless task until Isaac Newton in the 17th century was able to reduce them all to manifestations of a single law known as the law of gravitation. This law states that every two particles of matter in the solar system attract one another with a force which is proportional directly to the product of the masses and inversely to the square of the distance between them, that is, if either of the masses be doubled, the force is doubled, but if the distance be halved, the force is increased four-fold. From his time mathematicians have been engaged in working out the consequences of this law. If there are only two particles acting, they describe ellipses about one another, but if more than two act, the motion is so complicated that it taxes the mathematician to the utmost to determine it completely. The moon is attracted mainly by the earth, but it is much disturbed from its elliptic motion round the earth (that in the tube) by the pull of the sun (which mainly causes the motions of the tube), and to a small extent by that of the planets. Up to the last quarter of the 19th century this work was undertaken by European mathematicians, among whom may be mentioned Euler, Laplace, de Pontecoulant, Hansen, Delaunay and Adams: the tables of Hansen, published in London in 1857, are still used, with a few corrections, for the places of the moon in the nautical almanacs of the present day. The greatest advance made during the last 30 years was started by Dr. George William Hill, who was for many years on the staff of the 'American Nautical Almanac' at Washington. His two papers published in 1877 opened a new era in the mathematics of astronomy and especially in that of the moon, and they have formed the basis of nearly all the progress which has since been made in all departments of celestial mechanics. His name, though fully known to astronomers all over the world, is less familiar to the public, on account of the highly mathematical nature of his work. In a different part of the subject, the work of Professor Newcomb is not less valuable, comprising as it does, difficult and laborious investigations into the sufficiency of Newton's law for the explanation of every detail of the moon's motion, and involving researches into ancient records of eclipses of the sun. A new theory of the moon's motion, leading to the formation of new tables, has now been nearly completed by E. W. Brown on the basis of Dr. Hill's work. Brown has shown that Newton's law of gravitation will account for the motion of the perigee of the moon within $\frac{1}{1000000}$ of 1 per cent.

Secular Acceleration.— In illustration of the great accuracy with which calculations and observations may be compared at the present time may be mentioned what is known as the secular acceleration. Observation shows that at the end of each century the average time of revolution of the moon round the earth is 2 seconds less than it was at the beginning. Newton's law shows that a slight change in the shape of the earth's orbit (that is in the shape of the rail above) due to the attractions of the planets will account for ⅗ of this amount; the other ⅖ are still unexplained. This means that astronomers are searching for the cause of a monthly change of less than 1/1000 of a second in the length of the month.

Phases.—The phases of the moon arise from the combined motion of the earth and moon. To resume our mechanical model, imagine the tube to be transparent and the ball an electric light. When the bead is furthest from the ball, the side of the bead facing the carriage is illuminated and this corresponds to full moon. As the bead moves round the tube a spectator on the carriage sees less and less of the illuminated half; the bead then passes through its third and last quarters until it is at its nearest to the ball and almost invisible. Still progressing, its illuminated half begins to be visible from the other side (new moon) and passing on to its first and second quarters its illuminated half is again fully seen.

Eclipses.— An eclipse of the moon takes place whenever the earth gets between the moon and the sun, cutting off the light of the latter from the moon, an eclipse of the sun when the moon gets between the earth and the sun. (See Eclipse). It so happens that the apparent size of the moon as seen from the earth is very nearly equal to that of the sun. Owing to the varying distance of the moon and sun from the earth, sometimes the moon, as seen from a place on the earth, will completely cover the sun for a time which may be as long as eight minutes, and we have a total eclipse; at other times it fails to cover it and we get a partial eclipse or, if its centre passes across the sun's centre, an annular eclipse. A total or annular eclipse is seen over only a narrow band of the earth's surface. From our mechanical illustration it is evident that an eclipse of the moon can occur only at full moon, and one of the sun just before new moon. If the plane of the tube were horizontal there would be eclipses of both moon and sun every revolution of the bead, that is, once a month; actually, it is only when the bead is very near the horizontal plane (or near the line of nodes) at the time when it is nearest or furthest from the ball, that the event can take place. A complete cycle of eclipses will evidently occur each time the line of nodes completes a circuit — once in about 18 years. This is known as a lunar cycle and during that period there will be on the average 41 eclipses of the sun and 29 of the moon.

Tides.— Besides the indirect effect of the moon as a light-giver on the earth the most important influence it exerts is that which causes the tides. (See Tides). These have in their turn a slight reactionary effect on the motion of the moon as we shall see presently. Some slight traces of lunar effect are also observable in the variations of the earth's magnetism. But the most widespread idea with regard to lunar influence is its supposed connection with the changes in the weather. Many an old saying exists, handed down the ages, giving a rule for prophesying the weather by its condition at certain phases of the moon. Since the time when careful daily records have been kept of the temperature, height of the barometer, rainfall, etc., science has been employed in examining whether any kind of period can be traced in them and especially periods connected with the moon's changes. Little positive success has attended these efforts, but there is plenty of negative evidence. Every attempt to connect a periodical change in the weather with one in the moon's motion has resulted in failure. Undoubtedly some slight connection of a tidal nature must exist, but it is very small and is entirely masked by variations of the weather due to unknown causes. A reason for the popular error is not far to seek. The weather changes, especially in countries lying within the temperate zone, follow one another at short and seemingly irregular intervals; the changes of the moon's phases occur also at short but regular intervals. Coincidences between the two must frequently occur, but humanity is apt to notice these and to forget the failures of coincidence which are just as numerous if not more so.

Origin.— The past and future history of our satellite has been tne subject of interesting researches during the last 30 years, principally undertaken by Prof. George Howard Darwin. The chief influence in its life history is assigned by him to tidal action, an idea first broached in 1754 by the philosopher Emmanuel Kant. Imagining that the earth, unattended by any satellite, was in a molten condition — the most probable supposition in view of its nearly spherical form and the nature of its surface — Professor Darwin inquires under what conditions its rotation should be so rapid that, like a bursting fly-wheel, portions of matter should be thrown off. He finds that this would happen if the earth were rotating about its axis in something like two hours. He has also shown that pear-shaped and dumb-bell shaped forms will result from a rapid rotation and from the action of the sun in producing tides; the moon might have been evolved from such a figure by the thinning and breaking of the handle. The earth would then have a satellite revolving very close to its surface in the same time that the earth took to turn on its axis. Either of these hypotheses seems to be allowable.

Past History.— From this point, rigorous argument takes the place of speculation. The period of the satellite's revolution (a «month») begins to be slightly longer than that of the earth's rotation on its axis (a «day»). The moon raises tides on the earth and the friction of these, like a break on a fly-wheel, gradually lengthens the day; the reactionary effect on the moon is to increase the length of the «month» also, but more rapidly than the «day.» This goes on until the number of «days» in a «month» is 29. After this date the month and day still go on getting longer, but at different comparative rates, so that the number of days in a month diminishes until it is 27 1/3 — the present condition. The time in which all these changes have taken place must be reckoned in millions or tens of millions of years and though both bodies have grown cool and solid, the water on the earth's surface has in the later portion maintained the process at a slower rate. All this time the tidal friction has also had the effect of sending the moon further and further away from the earth.

Future.— In the future, the same processes will continue. The lengths of the month and that of the day will continue to increase, the latter overtaking the former until they are both over 1,300 hours or about 55 of our present days. Then, not only will the moon turn always the same face to the earth, but the earth will turn the same face to the moon and they will move together as if strung on a rigid bar. The same causes have operated to cause the moon always to present the same face to the earth. When the satellite was in a molten condition and not far from the earth, the tides raised on it by the attraction of the earth must have been enormous. The friction of these tides passing over the surface of the moon then slowed down the rotation of the moon on its axis until it was in a position where no more friction could act: that is, high tide on the moon was always at the same place on the moon and just under the earth. The axis of the moon in the direction of the earth must from this cause be a little longer than the other axis, though the difference has not been certainly observed.

Bibliography.— Besides the numerous textbooks on general astronomy, all of which contain information, readers may consult Nasmyth, ‹The Moon› (2d ed., 1903); Neison, ‹The Moon› (1873); Proctor, ‹The Moon› (1876); the ‹Lunar Theory› (1896) by the writer is a mathematical treatise on its motions. ‹The Tides,› by Darwin, contains the latest theories concerning its past and future history. A new photographic atlas and description by Pickering has just appeared. The Lick and Paris observatories are also gathering materials for a complete description and charts of the surface.

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MOON, Mountains of the, Africa, a mythical chain of mountains designated by Ptolemy as containing the sources of the Nile and extending across the broadest part of Africa from Cape Guardafui, on the Indian Ocean, to the Bight of Benin, on the Atlantic. Modern exploration has proved that no such range exists, though there are numerous different mountain systems in that extensive region. The only mountains that can be looked upon as representing the ancient Mountains of the Moon lie in eastern Equatorial Africa. The loftiest of these are Mount Kilimanjaro, 19,200 feet high; Mount Kenia, which has an estimated elevation of 17,191 feet, and Ruwenzori, which is 16,816 feet in height.

MOON GODDESS. See MYTHOLOGY, *Man and Nature.*

MOONEY, James, American ethnologist: b. Richmond, Ind., 10 Feb. 1861. He was educated in the public schools and began his career as a teacher. In 1879 he engaged in journalism and in 1885 began his connection with the Bureau of American Ethnology, Washington, with which he has remained ever since. He has conducted extended field investigations among the Indians of the South and West, notably the Cherokees; has prepared government Indian exhibits for Chicago, Nashville, Omaha and Saint Louis expositions and discovered the Cherokee ritual. He is a member of the American Anthropological Association, the Anthropological Society of Washington, the American Association for the Advancement of Science. He has published ‹Sacred Formulas of the Cherokees› (Washington 1891); ‹Siouan Tribes of the East› (Bull. 22, Bureau American Ethnology, Washington 1895); ‹Ghost-dance Religion and the Sioux Outbreak of 1890› (ib. 1896); ‹Calendar History of the Kiowa Indians› (ib. 1898); ‹Myths of the Cherokee› (ib. 1900); ‹Cheyenne Indians› (Lancaster 1907). He contributed Indian articles to various encyclopedias and also to the *Therapeutic Gazette* and *Harper's Monthly.*

MOONEYE, a fish of the small family *Hyodontidæ,* related to the herrings and sometimes called toothed herrings. They inhabit the rivers and lakes of the interior of North America, and are elegant, silvery, large-eyed fish, eight to 12 inches long, extraordinarily well supplied with teeth and voracious. «They are eager biters and take indiscriminately the feathered lures, small spoons, grasshoppers, grubs and other natural baits.» In Canada they afford much sport in fly-casting and repeatedly leap into the air when hooked, like trout. The principal species called mooneye is *Hyodon tergisus;* the more northerly one, called toothed herring and la quèche (Canada), is *H. alosoides.* Neither is good for food.

The «Mooneye cisco» is a small whitefish (*Argyrosomus hoyi*), related to the lake herring. See WHITEFISHES.

MOONFISH, any of the compressed ovate highly silvery fishes of the family Carangidæ, genera *Selene* and *Vòmer,* including small tropical forms allied to the pompanos. One greenish species (*Vomer setipinnis*) is well known in New York Bay and markets as a panfish, sometimes called blunt-nosed shiner. More widely recognized is the look-down or horsehead (*Selene vomer*), which reaches a length of more than a foot, and is regarded along the south Atlantic Coast as one of the best of food-fishes; it also occurs along the western coast of Mexico and Central America, as do certain other species. It has a rhomboidal outline, with a hind-head greatly elevated, the line of the profile almost equal to the length of the body, and the dorsal and ventral fins prolonged into streamers. Consult Jordan and Evermann, ‹Food and Game Fishes› (1902).

MOONGA, or **MOOGHA.** See SILKWORMS.

MOONLIGHT SONATA, a term used popularly in Germany and England for the Beethoven *sonata quasi una fantasia in C minor* (1802), dedicated to the «Damigella Contessa Giulietta Guicciardi.» The term arose from the critic Rellstab comparing the first movement to a boat gliding by moonlight on Lake Lucerne. Vienna knows it as «Laubensonata.»

MOONSEED. See SARSAPARILLA.

MOONSHINER, a term applied in the United States, and especially in the southern and western States, to makers of illicit whisky and other spirituous liquors. Moonshine stills are frequently raided by the secret service officers. Of late years the business has been largely confined to the Tennessee and Kentucky mountain regions.

MOONSTONE. A translucent or transparent variety of the mineral feldspar (orthoclase, albite or labradorite) which exhibits a delicate pearly opalescent play of colors. Used as a gem.

MOONWORT, a popular name for a fern (*Botrychium virginianum*) of the natural order *Ophioglossaceæ,* and also for various species of *Lunaria* of the natural order *Cruciferæ.* The former is the most popular of its genus, being readily grown in partial shade and with no special treatment; the latter are also readily cultivated under ordinary garden conditions and are popular because of their showy flowers, but more especially because of their large, flat pods which are used in winter decorations. One of their popular names, honesty, is suggested by visibleness of the seeds through the pods. *Lunaria annua,* especially its variegated variety, is the most valuable species.

MOORCROFT, William, English veterinary surgeon and traveler: b. about 1765; d. Andekhui, Afghanistan, 1825. He studied veterinary science in France, settled in London and made a fortune which he lost in patents, and then became veterinary surgeon (1808) to the Bengal army. He crossed the Himalayas, explored (1811–12) the sources of the Sutlej and Indus rivers, explored (1819–22) Lahore and Kashmir, visited Bokhara in 1825 and died at Andekhui, Afghanistan. Prof. H. H. Wilson edited and published his papers under the title 'Travels in the Himalayan Provinces of Hindustan and the Punjab from 1819 to 1825' (1841). He wrote also on veterinary surgery and made a translation of Valli's 'Experiments in Animal Electricity' (1793).

MOORE, Addison Webster, American professor of philosophy: b. Plainfield, Ind., 30 July 1866. He was graduated at De Pauw University (1893–94) and obtained Ph.D. diploma (1898) at Chicago University. He served in the University of Chicago as assistant in philosophy (1895–97), associate (1897–98), instructor (1898–1902), assistant professor (1902–04), associate professor (1904–09) and professor (1909). He was lecturing on philosophy at Harvard in 1918. Among his works are 'Pragmatism and its Critics' (1910); 'Existence, Meaning and Reality' (1903). He was president of the Western Philosophical Association in 1911 and of the American Philosophical Association in 1917 and associate author of 'Creative Intelligence' (1916).

MOORE, moor or mōr, **Alfred,** American jurist, son of Maurice Moore (q.v.): b. Brunswick County, N. C., 21 May 1755; d. 15 Oct. 1810. At 20 he became captain in a regiment of North Carolina troops, but was soon afterward obliged to resign in order to provide for his destitute relatives. When the British seized Wilmington, however, he raised a troop of volunteers, with whom he rendered great service to the American cause. In order to alleviate the distress to which his patriotism had reduced him, the general assembly in 1782 made him attorney-general; and though he had not yet mastered the first rudiments of law, he soon attained, by hard study, a foremost rank in his profession, was raised to the bench in 1798 and became associate justice of the Supreme Court of the United States in 1799. He resigned in 1805.

MOORE, Benjamin, American Protestant Episcopal bishop: b. Newtown, L. I., 5 Nov. 1748; d. New York, 29 Feb. 1816. He was graduated at King's (now Columbia) College in 1768, studied theology and in May 1774 went to England to obtain orders and in June of the same year was ordained deacon and priest. On his return to New York he became an assistant minister of Trinity Church and succeeded to the rectorship in December 1800. In 1801 he was consecrated bishop of New York. He was also rector of Trinity Church and president and professor of logic in Columbia College. In 1811 an attack of paralysis rendered him incapable of further active duty.

MOORE, Charles Herbert, American professor of art: b. New York, 10 April 1840. He was educated at Harvard and was professor of art at that university from 1896 to 1909. He has published 'Examples for Elementary Practice in Delineation'; 'The Development and Character of Gothic Architecture' (1889; enlarged ed., 1899), and 'Mediæval Church Architecture of England' (1912). In the latter work, which has been widely circulated among students of architecture, he takes the position, earlier adopted by Viollet le Duc, that English Gothic is wholly a development from a French source, and that the progress of the art in England was always some years behind its French original. His warm advocacy of this view has excited some opposition among English critics.

MOORE, Charles Leonard, American poet and essayist: b. Philadelphia, Pa., 16 March 1854. He was educated in the public schools of his native city. In 1878–79 he was one of the managers of the Madeira and Mamoré Railroad Construction Company and was United States consular agent at San Antonio, Brazil, the headquarters of that operation. He was afterward engaged in railroad construction in Pennsylvania. He was then secretary of one of the Disston Florida Sand companies for four years. For the last 20 years he has been occupied with literary work. He has been a constant contributor to *The Dial* during that time. He has published 'Atlas' (1881); 'Poems Antique and Modern' (1883); 'Book of Day Dreams' (1887); 'Banquet of Palacios' (1889); 'Odes' (1896); 'Ghost of Rosaly' (1900); 'Red Branch Crests' (1904); 'Incense and Iconoclasm' (1915).

MOORE, Clarence Bloomfield, American archæologist: b. Philadelphia, 14 Jan. 1852. He was graduated at Harvard (1873), then traveled through most of Europe, Asia and Egypt. He crossed the Andes and traveled down the Amazon (1876) and made a journey round the world (1878–79). During the last 20 years he has been exploring the Indian mounds of South Carolina, Georgia, Florida, Alabama, Mississippi and Louisiana. His many scientific writings have been mostly published by the Academy of Natural Sciences, of Philadelphia.

MOORE, Clement Clarke, American educator and poet: b. New York, 15 July 1779; d. Newport, R. I., 10 July 1863. He was a son of Benjamin Moore (q.v.); was graduated at Columbia College in 1798; in 1821 became professor of biblical learning at the General Theological Seminary, New York, and retired from that position in 1850. He gave to the seminary the ground on which it stands. A collection of 'Poems' which he published in 1844 included 'A Visit from Saint Nicholas,' better known under another title — 'Twas the Night Before Christmas' — which has long had great popularity with grown people as well as with children. Written in 1822 for his own children, these verses were printed anonymously and without Moore's knowledge, in the Troy *Sentinel* 23 Dec. 1823. He also compiled a 'Hebrew and English Lexicon' (1809) and wrote 'George Castriot, Surnamed Scanderbeg, King of Albania' (1850). Consult Stedman, 'An American Anthology' (1900).

MOORE, Clifford Herschel, American Latin professor: b. Sudbury, Mass., 11 March

1866. He was graduated (1889) at Harvard University and received (1897) the Ph.D. diploma (1897) at the University of Munich. He was classical master (1889–1892) at Belmont School, California, professor of Greek (1892–94) at Phillips Academy, Andover, Mass., instructor (1894–95), then assistant professor of Latin (1895–98) at the University of Chicago. From 1898 to 1905 he was assistant professor of Greek and Latin at Harvard and professor of Latin since 1905. He was professor of Latin (1905–06) at the American School of Classical Studies, Rome. He has been trustee for Phillips Academy since 1902. He wrote 'Religious Thoughts of the Greeks' (1916); and numerous articles on his special subjects and edited Allen's *Medea* (1899) and Horace's 'Odes and Epodes' (1902). In 1914 he received the degree of Litt.D. from Colorado College. Contributed to International Encyclopædia.

MOORE, David Hastings, American Methodist Episcopal bishop: b. Athens, Ohio, 4 Sept. 1838; d. Cincinnati, Ohio, 23 Nov. 1915. He was graduated from the Ohio University in 1860 and ordained to the ministry in that year, but entered the Federal army at the outbreak of the Civil War, remaining in it till the close of the war and attaining the rank of lieutenant-colonel. He was president of the Cincinnati Wesleyan Female College (1875–80) and of the Colorado Seminary, and chancellor of the University of Denver (1880–89). He was elected bishop in 1900 and had his episcopal residence during the three ensuing quadrennial periods in Shanghai, China, Portland, Ore., and Cincinnati, Ohio. He retired in 1912. He was a member of the General Conferences of 1888, 1892, 1896 and 1900, and of the North China Branch of the Royal Asiatic Society.

MOORE, Edward, English fabulist and dramatist: b. Abingdon, Berkshire, 1712; d. 1757. He was, by trade, a linen-draper but failed in business and took up literature. His first work was 'Fables for the Female Sex' (1744) and in 1748 his 'Trial of Selim the Persian' and 'The Foundling' were published. He owed, no doubt, some of his success in the literary world to such prominent patrons as George Lyttelton, 1st Baron Lyttelton, and Henry Pelham. His 'Gil Blas' was published in 1751 and 'The Gamester' in 1753, Garrick probably assisting him in the work. From 1753–57 he was editor of *The World,* a satyrical periodical. A collection of his works under title of 'Poems, Fables and Plays' was published in 1756.

MOORE, Edward, English Dante scholar: b. Cardiff, 1835; d. 2 Sept. 1916. He was educated at Pembroke College, Oxford, where he received high honors and became Honorary Fellow, and was principal of Saint Edmund Hall, 1864–1913 and a canon of Canterbury from 1903. His early research was on Aristotle and his editions of the 'Ethics' and of the 'Poetics' are excellent. But he is much more favorably known for his studies of Dante, and published 'Time References in the Divina Commedia' (1887; revised, in Italian, 1900); 'Textual Criticism of the Divina Commedia' (1889); 'Dante and His Early Biographers' (1890); the 'Oxford Dante' (complete in one volume, 1894); and 'Studies in Dante' (3 series 1896, 1899, 1903).

MOORE, Edward Caldwell, American theologian: b. West Chester, Pa., 1 Sept. 1857. He was graduated (1877) at Marietta College, then at Union Theological Seminary (1884). He studied (1884–86) at the universities of Berlin, Göttingen and Giessen, then received (1891) the degree Ph.D. at Brown University. In 1884 he was ordained to the Presbyterian ministry and served as pastor at Yonkers, N. Y. (1886–89), and Central Congregational Church, Providence, R. I. (1889–1901). He then became Parkman professor of theology and Plummer professor of Christian morals at Harvard University (1901—) and served as preacher to the university (1905–06). He lectured at Mansfield College, Oxford, England, in 1894 and 1913, at Andover Theological Seminary, 1900; Yale Divinity School, 1906; Lowell Institute, Boston, 1903. In 1909 he received the degree of D.D. from Yale University. He wrote 'The New Testament in the Christian Church' (1904); 'History of Christian Thought since Kant' (1912). He was a member of the American Board of Commissioners of Foreign Missions (1899–1914), its chairman (1905–14) and was elected president in 1914.

MOORE, Edward Mott, American surgeon: b. Rahway, N. J., 15 July 1814; d. Rochester, N. Y., 4 March 1902. He studied medicine in New York and Philadelphia and was graduated (1838) as M.D. at the University of Pennsylvania. He served as resident physician at Blockley Hospital and Frankford Lunatic Asylum but settled in Rochester in 1840. In 1842 he received a call to the chair of surgery at the medical school of Woodstock, Vt., where he lectured for 11 years. He served then successively at Berkshire Medical College, Massachusetts (1853–54); Starling Medical College, Columbus, Ohio (1854–55), then went (1858) to Buffalo Medical College, serving in the same capacity till 1883. His greatest work was done in research and experiments on the heart's action. He was president of the New York State Medical Society; a founder of the American Surgical Association, succeeding Dr. Gross (1883) as its president; and was president of the American Medical Association (1889–90). For many years he was president of the board of trustees of the University of Rochester, and also of Reynolds Library and Rochester Public Health Association.

MOORE, Eleakim Hastings, American mathematician: b. Marietta, Ohio, 26 Jan. 1862. He was graduated (1883) at Yale, receiving the Ph.D. diploma in 1885. He then studied at Berlin (1885-86) and was appointed tutor in mathematics at Yale (1887–89), becoming assistant professor (1889–91) at Northwestern University and associate professor (1891–92). In 1892 he was made professor of mathematics at the University of Chicago becoming head of the department since 1896. He edited *Transactions of the American Mathematical Society* (1899–1907) and has been associate editor of the *Proceedings of the National Academy of Sciences* since 1915. He was vice-president at the International Congress of Mathematicians held at Cambridge, 1912. The mathematical periodicals of Europe and America have published many of his contributions.

MOORE, Frank Frankfort, British novelist and dramatist: b. Limerick, Ireland, 15 May

1855. He was educated at the Royal Academical Institution, Belfast, and has traveled extensively in Africa, India and South America. From 1876 to 1892 he was art editor of the Belfast *News Letter*. He has since lived in London. Among his recent novels are ‹Nell Gwynne› (1900); ‹The Capture of Coralie› (1900); ‹He Loved but One› (1905); ‹Priscilla and Charybdis› (1910); ‹The Lady of the Reef›; ‹The Romance of a Red Cross Nurse› (1915); ‹The Rise of Raymond› (1916). Popular plays by him include ‹Moth and Flame› (1878); ‹Broken Fetters› (1881); ‹Oliver Goldsmith› (1892); and ‹Kitty Clive› (1895); and he is also author of ‹The Discoverer› (verse, 1911); ‹A Georgian Pageant› (essays, 1910); and a work on antiques, ‹The Commonsense Collector› (1911).

MOORE, Frank Gardner, American educator: b. West Chester, Pa., 25 Sept. 1865. He was graduated (1886) at Yale, receiving the Ph.D. diploma in 1890. He studied (1890–91) at the University of Berlin and became tutor in Latin (1888–93) at Yale. He was made assistant professor in Latin (1893–1900) at Dartmouth College, then associate professor of Latin and Roman archæology (1900–08). He was made professor of Latin (1908–10) at Trinity College, Hartford, Conn., and professor of classical philology at Columbia University from 1910. He edited Tacitus' ‹Histories,› (Vols. I and II, 1910); Cicero's ‹Cato Major› (1904) and ‹Transactions and Proceedings of the American Philogical Association,› of which society he was secretary (1904–16), becoming president in 1917.

MOORE, George, English author: b. Ireland, 1853. He studied art in London under Luyten, but completed his education in France and became thoroughly imbued with a Gallic spirit. Apart from a few contributions to periodicals, his first literary work was contained in two volumes of quasi-French verse, ‹Flowers of Parnassus› (1877) and ‹Pagan Poems› (1881). With his entry into fiction he allied himself immediately with the French realistic or naturalistic school, as may be seen in ‹A Mummer's Wife› (1884), a story of the degeneration of a farmer's wife, her elopement with a strolling player, and the sufficiently squalid sequel; in ‹Mike Fletcher› (1891), in which a gay young Irishman wins a fortune by his wits and his social success, and then swings from his riotous living to remorse and back again, only to commit suicide at the end; or in ‹Esther Waters› (1894), a detailed sketch of life among the servant class and in a country inn, the theme being the allurements of gambling. ‹Evelyn Innes› (1898) and its sequel, ‹Sister Teresa› (1901), are a keen analysis of a musical and sensuous temperament under the successive influence of social temptation and of convent life. What he exemplified in these novels he stated abstractly but over-eagerly and passionately in ‹Confessions of a Young Man› (1888) and ‹Impressions and Opinions› (1890), both urging the dead level of mediocrity or worse in English literature of the day as contrasted with French. His desire to found an English «Theatre Libre» and his growing conviction that the English stage and English novel were far gone led him to assist in founding the Irish Literary Theatre in Dublin and to take a prominent part in the movement styled the Irish Renaissance, a movement of which his ‹Bending of the Bough› (1900) is one of the most promising dramatic productions and ranking above ‹The Strike at Arlingford› (1893). His later works include ‹The Untilled Field› (1903); ‹The Lake› (1905); ‹Memoirs of My Dead Life,› which purports to be autobiographical; the autobiographicals ‹Hail and Farewell› (3 vols., New York 1911–14); ‹The Brook Kerith› (1916), a brilliantly written novel of Palestine in the times of Christ, the publication of which gave rise to a good deal of criticism; ‹Lewis Seymour and Some Women› (1916).

MOORE, George Foot, American Orientalist: b. West Chester, Pa., 15 Oct. 1851. He was graduated at Yale in 1872 and at Union Theological Seminary in 1877. Entering the Presbyterian ministry, he was pastor of the Putnam Presbyterian Church, Zanesville, Ohio, 1878–83, and in the latter year became Hitchcock professor of Hebrew and the history of religions at Andover Theological Seminary, and from 1899 to 1901 was president of the faculty there. In 1902 he was appointed professor of theology at Harvard and in 1904 Frothingham professor of the history of religions. For some years he edited the ‹Journal of the American Oriental Society,› of which he was president 1911–12. He has written ‹A Commentary on Judges› (1895); ‹The Book of Judges,› a translation with notes for the Polychrome Bible (1898); and ‹The Book of Judges in Hebrew› (1900); ‹The Literature of the Old Testament› (1913); ‹History of Religions› (Vol. I, 1913); and ‹Metempsychosis› (Ingersoll lecture at Harvard, 1914).

MOORE, George Henry, American historical writer: b. Concord, N. H., 20 April 1823; d. New York, 5 May 1892. In 1839 he removed to New York and was graduated at the University of the City of New York (now New York University) in 1843. As assistant to his father, Jacob Bailey Moore (q.v.), librarian of the New York Historical Society, he had been long connected with that institution when, in 1849, he succeeded to his father's position, which he held until 1872, and then became first superintendent of the Lenox Library. This office he retained until his death. His contributions to the proceedings of historical societies and to historical magazines were numerous. He also published ‹The Treason of Charles Lee› (1858); ‹The Employment of Negroes in the Revolutionary Army› (1862); ‹Notes on the History of Slavery in Massachusetts› (1866); and ‹A History of the Jurisprudence of New York› (1872).

MOORE, George Thomas, American botanist: b. Indianapolis, 23 Feb. 1871. He was educated at Wabash College and graduated A.B at Harvard (1895), A.M. 1896 and Ph.D 1900. He was appointed assistant in cryptogamic botany at Harvard and teacher at Radcliffe College. From 1899–1901 he had charge of the botany department at Dartmouth College and was (1903–05) physiologist and algologist at the Bureau of Plant Industry, Department of Agriculture. He had charge of botany at the Marine Biological Laboratory at Woods Hole, Mass., and became professor of applied botany and plant physiology at Shaw School of Botany, Washington University (1909–12). as well as being physiologist to the Missouri Botanical Garden, of which latter he became director from 1912. Among his most useful work was the discovery of a method of preventing water supply pollution through algæ and pathogenic bacteria, and the perfection of a method of increasing crops by impregnation of the soil, through bacteria, with atmospheric nitrogen. He has contributed many useful scientific articles to the botanical periodicals.

MOORE, Harry Humphrey, American artist: b. New York, 1844. He studied under Gérôme at Paris and Fortuny in Madrid, and subsequently made painting tours through Germany, Italy and as far east as Japan. He has devoted himself to such genre pictures as his two masters excelled in, and his best-known works are ‘Gypsy Encampment, Granada’; ‘Moorish Water-Carrier’: ‘Almeh’; ‘The Blind Guitar-Player’; and ‘A Moorish Beggar.’ He is deaf and dumb.

MOORE, Sir Henry, English colonial governor: b. Vere, Jamaica, 1713; d. 1769. In 1756 he became lieutenant-governor of the island, and until 1762 was practically in control of its affairs. He suppressed the slave insurrection of 1760, and for that service was rewarded with a baronetcy. Appointed governor of New York in July 1765, he reached there at the outbreak of the Stamp Act excitement. Public opinion was strongly pronounced against the act, and Moore, yielding to the demands of the colonists, suspended its enforcement. He remained governor until his death.

MOORE, Henry, Irish Wesleyan clergyman: b. near Dublin, 1751; d. 1844. After conversion, he joined a Methodist class in 1777, began to preach, gave up his trade of wood-carver, opened a school, and in 1779 was appointed by Wesley to the Londonderry circuit. Called later to London, he assisted Wesley (1784–86) as traveling companion and amanuensis, serving again in the same capacities 1788–90. Wesley appointed him one of his three literary executors, and also selected him to become (after Wesley's death) one of 12 ministers in charge of services at the City Road Chapel, London. In 1804, and again in 1823, Moore was president of the Wesleyan Conference. Refusing ordination in the Church of England, he was ordained by Wesley, with two Episcopal clergymen assisting. The proposal to establish a hierarchy in the Methodist Church was opposed by Moore, who also objected to the scheme for establishing a Methodist theological school, and to the proposed acquisition of land by the Methodist body in 1839, when the centenary fund was created. In 1792, with Thomas Coke, he published a Life of the Rev. John Wesley.’ Although the work was authorized by the Conference, the third literary executor prevented them from using Wesley's papers in its preparation. With the aid of these he wrote a new ‘Life,’ which was published in 1824–25. Moore also wrote ‘A Reply to Considerations on the Separation of the Methodists from the Established Church’ (1794); ‘Thoughts on the Eternal Sonship’ (1816); two religious biographies; ‘Sermons,’ with an autobiography (1830). Consult ‘Life’ (with the autobiography) by Mrs. Richard Smith (1844).

MOORE, Jacob Bailey, American journalist and author: b. Andover, N. H., 31 Oct. 1797; d. Bellows Falls, Vt., 1 Sept. 1853. He learned the printer's trade on the Concord *Patriot,* became bookseller and publisher, then partner in the above paper. In 1826 he founded the *New Hampshire Statesman* to aid the election of John Quincy Adams as President, and became (1828) member of the State legislature and, in the same year, sheriff of Merrimac County (1828–33). In 1839 he edited the *New Hampshire Journal,* but soon moved to New York to edit the *Daily Whig.* He was government clerk in the Washington post office (1841–45), then librarian of the New York Historical Society (1845–49), when he moved to San Francisco as its postmaster (1849–53). He collaborated in compiling a topographical, historical and biographical work on New Hampshire (Concord 1822–24), and he published ‘A Gazetteer of the State of New Hampshire’ (1823); and histories of Concord and of Andover, N. H., and ‘Memoirs of American Governors’ (1846).

MOORE, James, American colonial governor: b. probably in Ireland about 1640; d. Charleston, 1706. He is supposed to have been a son of the Irish rebel, Roger Moore, and to have come to this country about 1665. Settling in South Carolina, he became a leader among those who openly resisted the lords proprietors in their oppressive demands. In 1682 he was made a member of the governor's council, and in 1692 was sent to the Assembly. In the latter year the proprietors named him for exclusion from their pardon. Two years later he was again one of the governor's council; that body in 1700 elected him governor; and he filled the executive office until 1703, when Sir Nathaniel Johnson arrived. Appointed by the Assembly to lead an expedition for the capture of Saint Augustine (1702). Moore took the town without difficulty, but failed to reduce the fort. Under Governor Johnson he served as attorney-general, and was successful in an expedition (1703) against the Apalachee (q.v.). Consult McCrady, ‘History of South Carolina Under the Proprietary Government’ (1897).

MOORE, James, American colonial officer: b. Charleston, S. C., 1667; d. 17 Feb. 1723. He was a son of the James Moore preceding, in whose expeditions against the Indians he participated. In 1713 Governor Craven appointed him commander of the forces sent to aid the North Carolina colony against the Tuscarora Indians, and two years later served as lieutenant-general of an expedition sent to subdue the Yamasi. In 1719, when Gov. Robert Johnston was deposed, the Convention having made an end of the proprietary government, Moore became governor. He was succeeded in 1721 by Francis Nicholson, who was commissioned by the English crown, afterward becoming speaker of the assembly.

MOORE, James Hobart, American lawyer and promoter: b. Berkshire, N. Y., 14 June 1852; d. 8 July 1916. He was bank clerk (1871–73) at Binghamton, N. Y., went to Chicago (1873) and was admitted to the Illinois bar (1881). In collaboration with his brother, William H. (q.v.), he created the great «Moore group» of four great corporations which together had a capitalization of $187,000,000, these since being incorporated in the United States Steel Corporation. They were also the promoters of the National Biscuit Company, and other mercantile amalgamations. He was a director of the American Can Company, American Tin Plate Company, and numerous other leading industrial corporations.

MOORE, John, Scottish physician and author: b. Stirling, December 1729; d. Richmond, Surrey, 21 Jan 1802. Having obtained a knowledge of medicine and surgery he went to the Netherlands in 1747, and served as a surgeon's mate in the military hospitals. Returning to Scotland he practised till 1772. In that year he became medical attendant to the ninth Duke of Hamilton, whom he accompanied on a five-year tour on the Continent. In 1779 he published ‹A View of Society and Manners in France, Switzerland and Germany,› which passed through numerous editions, and has been translated into several foreign languages. In 1781 appeared his ‹View of Society and Manners in Italy›; and in 1786 ‹Medical Sketches,› followed by ‹Zeluco,› a novel (1786); ‹A View of the Causes and Progress of the French Revolution› (1795); and two other novels, which were not so successful as his first.

MOORE, Sir John, British soldier, son of the preceding: b. Glasgow, Scotland, 13 Nov. 1761; d. Spain, 16 Jan. 1809. He served in Nova Scotia during the American Revolutionary War; from 1784–90 was member of Parliament for a group of Scottish burghs; served in Cordica, the West Indies (1795), in Ireland during the rebellion of 1798, in Holland in 1799 and in Egypt in 1800–01. He was created Knight of the Bath in 1804 and was in command in the Mediterranean (1806–08). He was appointed commander-in-chief of the British army in Portugal in 1808. His intention was to cut the French communications with Madrid, but struggling against the apathy of the Spaniards and intrigue among his own countrymen, he advanced to Salamanca in spite of the gravest difficulties, but was ultimately forced to make a midwinter march to Coruna, a distance of 250 miles, through a desolate and mountainous country, rendered almost impassable by snow and rain, and constantly harassed by the enemy who outnumbered him by three to one. His troops arrived at Coruna in a distressing condition; Soult was ready to attack him as soon as he began the work of embarkation, and in the battle that followed Moore fell, mortally wounded, in the hour of victory. Wolfe's celebrated poem, ‹The Burial of Sir John Moore,› keeps his memory green. Consult Carrick Moore, ‹Life of Sir John Moore› (1835), and his ‹Diary› (ed. by Maurice 1904).

MOORE, John Bassett, American lawyer, diplomatist and author: b. Smyrna, Del., 3 Dec. 1860. He attended private schools and was graduated at the University of Virginia in 1880. He read law in the office of Edward G. Bradford, now United States district judge at Wilmington, Del., and was admitted to the bar there in 1883. In 1885 he passed the first civil service examination for admission to the Department of State, at Washington, and was appointed a law clerk in that department in July of that year. In August 1886 he was appointed Third Assistant Secretary of State. In the summer of 1887, he acted as secretary to the conference between the Secretary of State and the British and German ministers on the affairs of Samoa; and in the winter of 1887–88 he acted as American Secretary in the conference on the North Atlantic Fisheries. He assisted at the organization of the First International American Conference at Washington, and later made a report to the conference on the subject of extradition. In 1891 he resigned the post of Third Assistant Secretary in order to take the newly-created chair of International Law and Diplomacy at Columbia University, New York, a chair which he has since continued to hold. In April 1898, on the outbreak of the war with Spain, he was without solicitation appointed by President McKinley to the position of Assistant Secretary of State. This position, which he had on three previous occasions declined, he resigned in September of the same year, in order to accompany the American Peace Commission to Paris as Secretary and Counsel, in which capacity he took part in the negotiation of the Treaty of Peace with Spain. In 1904 he acted as agent of the United States before the United States and Dominican Arbitration Tribunal. He was a member of the delegation of the United States in the Fourth International American Conference, at Buenos Aires, in 1910, and afterward served as a special plenipotentiary to the Chilean Centenary. In 1912 he was appointed the delegate of the United States on the International Commission of Jurists, which was organized at Rio de Janeiro in that year, under the Pan-American Treaty of 1906, for the codification of International Law. In March 1913 he became by appointment of President Taft a member of the Permanent Court of Arbitration at The Hague. In the following month he was appointed by President Wilson counselor for the Department of State and was invested with authority to sign as acting Secretary of State in the absence of the Secretary, the grade of the position thus being raised. He resigned the post of counselor in March 1914. Mr. Moore is a member of the Institut de Droit International, of the Institut Colonial International, of the American Philosophical Society, of the American Political Science Association, of which he was president in 1913–14, and of various other learned societies. He is a member and honorary secretary of the Hispanic Society of America; and an honorary member of the College of Lawyers at Costa Rica. He was a member of the Pan-American Financial Congress at Washington in May 1915, acting as chairman of the committee on uniform laws, by which the scheme of work of the Congress was drawn up; and he is vice-chairman of the American section of the International High Commission organized to carry out the plans of the Congress. He was a delegate of Columbia University and of various learned societies in the Second Pan-American Scientific Society at Washington, December 1915–January 1916. He is vice-president of the Pan-American Society of America. He is an incorporator of the American National Red Cross and a member of its central committee and of the executive committee of the New York chapter. His publications, apart from occasional papers and addresses, include ‹Report on Extraterritorial Crime› (Washington 1887); ‹Report on Extradition› (Washington 1890); ‹Extradition and Interstate Rendition› (2 vols., Boston 1891); ‹American Notes on the Conflict of Laws› (Boston 1896); ‹History and Digest of International Arbitrations› (6 vols., Washington 1898); ‹American Diplomacy, its Spirit and Achievements› (New York 1905); ‹A Digest of International Law› (8 vols., Washington 1906); ‹The Works of James Buchanan› (12 vols., Philadelphia 1908); ‹Four Phases of American Development: Federalism, Democracy, Imperialism, Expansion› (Baltimore 1912). He is one of the editors of the *Political Science Quarterly,* of the *Journal du Droit International Privé,* etc.

MOORE, John White, American naval officer: b. Plattsburg, N. Y., 24 May 1832; d. 1913. He was educated at Plattsburg Academy, Williston Seminary and under private tuition at New York City. He was appointed (1853) third assistant engineer, United States navy, promoted (1855) to second assistant engineer, becoming (1894) chief engineer. For valuable service in the Civil War he was created (1906) rear-admiral. He originated chain cable protection on sides of wooden vessels and of «fighting tops,» now in general use. After being in action with the West Gulf Blockading squadron and the lower Mississippi River, engaging rebel batteries at head of passes and at defense of Pensacola (1861), passage and capture of forts Jackson and Saint Philip, capture of New Orleans and Port Hudson (1863), etc., he became superintendent of ironclads at New York and Boston (1863–67) and served at various navy yards. He was fleet engineer (1867–68) on staff of Admiral Farragut, European squadron, and fleet engineer of Asiatic station (1872–75). He retired in 1894 with the rank of commodore, serving, however, as inspector of the New York navy yard during the Spanish American War.

MOORE, Maurice, American patriot and jurist: b. Brunswick County, N. C., 1735; d. 1777. Having studied for the bar, he acquired a high reputation as a lawyer, was one of the three colonial judges of North Carolina at the time of the Revolution, was a member of the provincial congresses at Hillsborough in 1775 and Halifax in 1776 and had a prominent part in framing the constitution of North Carolina. He was one of a committee appointed at the commencement of the Revolution to draw up an address to the people of Great Britain on the wrongs of the North American colonies. His letter to Governor Tryon, under the signature of «Atticus,» is an incisive piece of work.

MOORE, Robert, American civil engineer: b. New Castle, Pa., 19 June 1838. He was graduated (1858) at Miami University, receiving A.M. diploma in 1866. He has been engaged principally in the location and construction of railways such as the Illinois Central, the Illinois Southern, the Baltimore and Ohio, etc. He was sewer commissioner and a member of the board of public improvements at Saint Louis (1877–81) and has been consulting engineer for a number of railway companies and reorganization commissions. From 1897–1913 he was a member of the Saint Louis board of education and its president 1905–06 and 1909–10. He was a member of the Brazos River Board and the South West Pass board of engineers, and is a past-president of the American Society of Civil Engineers, etc.

MOORE, Thomas, Irish poet: b. Dublin, 28 May 1779; d. Bromham, near Devizes, 25 Feb. 1852. He was educated at Trinity College, Dublin, with a view of becoming a lawyer, and in 1800 entered as a student at the Middle Temple. In 1800 he published a translation of ‹Anacreon› dedicated to the Prince of Wales (his enemy in after years), and in 1801 ‹The Poetical Works of the late Thomas Little.› His fine musical talent got him admission to the best society. The office of admiralty registrar at Bermuda was bestowed on him in 1803. The post was given to him as a sinecure, and he quitted it after appointing a deputy to perform his duties. In November 1804 after a tour through the United States and British America, he was back again in England. In 1806 he published ‹Odes and Epistles,› which contained some attacks on America, and, castigated by Jeffrey in the *Edinburgh Review,* occasioned the memorable frustrated duel between him and the distinguished critic who had no bullet in his pistol. Moore entered in 1807 into an engagement with Power, the music publisher, to produce a series of adaptations to the national Irish airs, he furnishing the words and Sir John Stevenson the music. This great undertaking, which extended over a number of years, only completed in 1834, is the work on which his reputation will mainly rest. Many of the numbers, such as ‹The Last Rose of Summer,› and ‹Those Evening Bells,› are generally familiar. His ‹National Airs› (1815) included ‹Oft in the Stilly Night› and the ‹Sacred Songs› (1816); ‹Sound the Loud Timbrel.› In 1811 he married Bessie Dyke, an actress. ‹The Twopenny Post Boy, by Thomas Brown the Younger,› a series of satires on the proceedings of the prince-regent and his ministers, appeared in 1812, and by their genuine wit attracted much attention and in this kind of composition he afterward excelled. The same year he removed to Mayfield Cottage, near Ashbourne, Derbyshire, and here his ‹Lalla Rookh› was elaborated. Its production was the result of an agreement with Messrs. Longman, by which he was to receive 3,000 guineas for a poem to form a quarto volume. It appeared in 1817, and its success fully justified the liberality of Moore's publishers. It was translated into numerous languages, and attained a European fame. Later criticism has deemed it rather a work, as Garnett says, «of prodigious talent,» than of the genius ascribed to it in Moore's own day. The same year appeared a satirico-burlesque poem, ‹The Fudge Family in Paris› (1818) in the form of a series of amusing letters supposed to be written by the different members of an excursion party to the Continent. ‹Rhymes on the Road› and ‹Fables of the Holy Alliance› followed in 1819. About this time he became involved in serious embarrassments by the defalcations of his deputy in Bermuda and found himself suddenly called upon to make up a deficiency of £6,000, ultimately reduced to about £1,000. This vast sum he contrived to clear off by his literary earnings. In 1822 appeared his ‹Loves of the Angels› The ‹Life of Sheridan› was produced in 1825, and the ‹Epicurean,› a prose romance of small value, in 1827. Next came the justly praised

‹Life of Lord Byron› (1830). (See BYRON). His remaining works include the ‹History of Ireland› (1846), written for Lardner's ‹Cyclopædia› and a task which he found very severe. For nearly the last 30 years of his life he resided at the cottage of Sloperton, near Devizes. Moore's fame, great in his own day, has suffered diminution, except in so far as his songs are concerned, his more ambitious poems being little read. A biography in eight volumes, edited from his journal and correspondence, was published after his death by his friend, Lord John Russell (1853–56). Consult also Clark, J. C. L., ‹Tom Moore in Bermuda› (Boston 1909); Gwynn, ‹Thomas Moore› (in the ‹English Men of Letters› series, London 1905); Gunning, ‹Thomas Moore, Poet and Patriot› (ib. 1900); Vallat, ‹Thomas Moore sa vie et ses œuvres› (Paris 1887). See LALLA ROOKH.

MOORE, William Henry, American lawyer and capitalist: b. Utica, N. Y., 25 Oct. 1848; d. 16 May 1916. He was educated at Amherst College and called to the Wisconsin bar 1872. He settled in Chicago making a specialty of corporation law and, with his brother James H. (q.v.), he created the great «Moore Group» of four corporations having a total capitalization of $187,000,000, all of which have since become absorbed in the United States Steel Corporation. Other immense industrial amalgamations brought about by them were The Diamond Match Company, National Biscuit Company, American Tin Plate Company, etc. He was known to the public as «Judge Moore,» through his prominent position at European and American horse shows, his own stable taking frequent prizes for coaching teams. He was director of the Delaware and Lackawanna Railway Company, the Lehigh Valley Railroad Company, American Cotton Oil Company, First National Bank of New York, etc.

MOORE, Willis Luther, American meteorologist: b. Scranton, Pa., 18 Jan. 1856. At eight years of age he joined his father, with Grant's army, at City Point, Va., and sold papers to the troops in the field; was educated in the Binghamton public schools; was student of natural sciences under scientific staff of the Weather Bureau for 15 years and under private tutors six years. He served full apprenticeship as printer and pressman on the Binghamton *Republican*, and worked as union printer in Chicago, Burlington, Iowa and Washington, D. C.; entered Signal Corps (now Weather Bureau) 1876, and rose through successive grades to local forecast official in Milwaukee, 1891–94; won professorship of meteorology in open competitive examination against 23 contestants, 1894, and was assigned to duty as district forecaster at Chicago; was chief United States Weather Bureau, 1895–1913; professor applied meteorology George Washington University 1914. He was lecturer for the Royal Institution (London) in 1912; and is popular lecturer on the Lyceum and Chautauqua circuits; is fellow of the American Association for the Advancement of Science; and honorary member of the Royal Meteorological Society (London), and of the Austrian Meteorological Society; was president of the National Geographic Society, 1905–10; and vice-president Washington Academy of Science, 1900–10. He has published ‹Descriptive Meteorology› (1904); ‹Meteorological Almanac› (1901); and is a contributor to scientific and other publications.

MOORE, Zephaniah Swift, American educator, first president of Amherst College: b. Palmer, Mass., 20 Nov. 1770; d. 29 June 1823. He was graduated at Dartmouth College in 1793, entered the Congregationalist ministry, and preached at Leicester, Mass., from 1798 until 1811, when he was appointed professor of languages in Dartmouth College. He was chosen president of Williams College in 1815, but failing in his efforts to procure the removal of the institution to the banks of the Connecticut, he resigned in 1821, and was chosen president of Amherst College.

MOOREA, mō″ō-rā′ạ, or **EIMEO,** ī′mĕ-ō, one of the Society Islands, in the Pacific Ocean, about 20 miles west-northwest of Tahiti, the principal member of the group; area 51 square miles. It consists of deep valleys and abrupt hills — the former well cultivated, and the latter heavily timbered. Here Christianity was first introduced in Polynesia; and here the South Sea College of the London Missionary Society was established. Most of the natives are Protestants. Pop. 1,500.

MOOREHEAD, moor′- or mōr′hĕd, **Warren King,** American archæologist: b. Sienna, Italy, of American parentage, 10 March 1866. He was educated in public schools of Ohio, and devoted himself to the study of Indian archæology and later studied three years in the Smithsonian Institution, and was afterward engaged in investigations of the earthworks and other Indian relics in Ohio for four years. He had charge of the investigations in Ohio, Utah, Colorado and New Mexico for the Chicago exposition and was curator of the museum of the Ohio State University. He is at present curator in the department of archæology at Phillips Academy. He is a member of the United States Board of Indian Commissioners; and since 1909 has investigated conditions on Indian reservations for the Interior Department; fellow of the American Association for the Advancement of Science. He received the degree of M.A (honorary) from Dartmouth in 1901, and has published ‹Primitive Man in Ohio› (1892); ‹Stone Age in North America› (1910); ‹American Indian in the United States› (1914).

MOORE'S CREEK, a short stream in North Carolina, which flows into Cape Fear River about six miles above Wilmington. Moore's Creek is noted on account of a battle fought on its banks, 27 Feb. 1776, between American and British forces. The British soldiers, nearly all Highland Scotch under Brigadier-General MacDonald, numbered 1,500, and the Americans under Caswell and Lillington numbered 1,000. The charge was made by the British, who tried to cross the stream on the girders of a bridge, the planks had been taken away, but the militia and minute men of the American force routed them. Fully 30 British were killed, many wounded, and about 700 taken prisoners. The victory gained by the Americans was an inspiration to the Carolinas; it had the same effect in the South that the Battle of Lexington had in New England.

MOORES HILL COLLEGE, in Moore's Hill, Ind.; coeducational; opened in 1856 by Methodist Episcopals. In 1917 the college had 14 professors and instructors, 106 students, and about 6,000 bound volumes and 2,000 pamphlets in the library. The grounds, buildings and apparatus were valued at $35,000, the productive fund was $30,000, and the annual income about $13,000. The courses of the collegiate department lead to the degrees of A.B., B.S., and Ph.B.

MOORHEAD, mōr'hĕd, Minn., city, county-seat of Clay County, on the Red River of the North, and on the Great Northern and the Northern Pacific Railroad, opposite Fargo, N. Dak. It is in a productive farming region in which wheat is one of the great crops. It has flour mills, grain elevators, foundries, machine shops, brick yards, and stock yards. It is a trade centre for a large part of Clay and Norman counties, and ships large quantities of wheat. It is the seat of Concordia College, the Sharp High School, a State Normal School, and has public and parish schools. The city owns and operates the electric-light plant and the waterworks. Pop. (1920) 5,720.

MOORISH ART. See ARCHITECTURE; MOHAMMEDAN ART.

MOORS (Lat. *Mauri;* Sp. *Moros;* Dutch, *Moors*), the people of Morocco. The Arabs who conquered the Roman province of Mauritania in North Africa in the 7th century converted to Mohammedanism the native population, who in Europe were still called Moors, though in their own language they called themselves Berbers, while by the Arabs they were termed Moghribees, «westerners» or «men of the west.» Arabic manners and customs, and in a corrupt form the Arabic language, soon prevailed in the country, the Arab conquerors freely amalgamating with their converts, who far exceeded them in numbers. In 711 an army drawn from this mixed population, under Arab leaders, crossed the straits at Gibraltar, so named from their leader, and began the conquest of the Spanish peninsula. The Spaniards and Portuguese called these invaders Moors because they came from Mauritania, and the term Moors with them soon became synonymous with Mohammedans or Moslems, as the invaders designated themselves. The Spanish writers subsequently applied the term to all the Mohammedans of northern Africa; and when, at the close of the 15th century, the Portuguese made their way around the Cape of Good Hope and encountered the Arabs on the coasts of East Africa and of Asia, they still called them Moors. See MOROCCO.

MOOS, mōs, **Salomon,** German aurist: b. Randegg, Baden, 15 July 1831; d. Heidelberg, 15 July 1895. He studied at Heidelberg, Prague and vienna; in 1859 he became privat-docent at Heidelberg, and in 1866 professor of aural surgery there. His most valuable researches were in relation to the diseases of the labyrinth of the ear, and he was the first to demonstrate that in certain infectious diseases, micro-organisms within the ear labyrinth cause derangement of hearing and equilibrium. He wrote ‹Klinik der Ohrenkrankheiten› (1866); ‹Anatomie und Physiologie der Eustachischen Röhre› (1874); ‹Über Meningitis cerebro-spinalis epidemica› (1881); ‹Über Pilzinvasion des Labyrinths im Gefolge von einfacher Diphtherie› (1887); ‹und im Gefolge von Masern› (1888); ‹Untersuchungen über Mittelohrerkrankungen bei den verschiedenen Formen der Diphtherie› (1890). He also founded and edited with Knapp the ‹Zeitschrift für Ohrenheilkunde.›

MOOSE. The deer family (*Cervidæ*) embraces not only all the round-horned deer, but also the caribou and moose, whose horns are flattened in a manner known as «palmation.» Of this family, the American moose (*Alces americanus*) is the most colossal and also the most picturesque member. The moose of Europe and Asia, there called «elk» (q.v.), is a much smaller animal. Even in comparison with the largest American elk, our moose, is a giant, and it is impossible to appreciate fully the great height and bulk, length of leg and size of antlers of this wonderful creature, without seeing a full-grown bull, either in his native wilds or mounted in a museum.

At nearly every point the species presents a peculiarity. The largest specimens ever shot and measured by naturalists stood from 78 to 84 inches in height at the shoulders. The body is very short in comparison with the great length of the legs, but the depth of the chest is unusually great. The end of the nose is flabby and pendulous, and overhangs the end of the chin by three or four inches. In browsing it is half prehensile, and is of great use in conveying twigs into the mouth. A moose in full winter pelage is covered by a coarse thatch of straw-like hair, from three inches in length on the body to six inches on the neck and shoulders. The color of the hair is purplish-gray, and for an animal which lives so far north, the pelage is exceptionally coarse and open.

The antlers of the moose are strikingly peculiar. The upper two-thirds of the beam is enormously flattened, often to a width of 12 inches or more, and the upper end of this great shovel of solid bone terminates in a row of from 6 to 12 short points. The single brow-tine is also well palmated, and usually terminates in three or four long points of great strength. Occasionally the main shovel throws out sidewise a palmated spur of striking form and size, and such a head when seen from the front presents a choatic jumble of tines and palmations. The largest antlers known are in the Field Columbian Museum, and have a spread of 78 inches, greatest width of palmation 16 inches, thickness of palmation 2⅛ inches, and a total of 34 points. The weight of the antlers and skull is 93¼ pounds. At least 25 pairs of antlers are known to exceed 70 inches in spread. The female has no antlers.

The moose is a browsing animal, and its favorite food consists of twigs of the willow, birch, hemlock, spruce, alder, aspen and maple. It also feeds upon moss, and in summer is very fond of wading in ponds and eating the stems and leaves of water-lilies. Because of their very unusual feeding-habits, moose are very difficult to rear in captivity to adult age. About 90 per cent die of gastro-enteritis before they attain the age of three years. For this reason the market value of a live moose is far below its rarity and general desirability in a collection. Moose calves are born either singly or in pairs, in May or June. At birth an average specimen stands about 32 inches in height, and is a most grotesque-looking creature. Its first coat of hair is sandy-red, like that of a buffalo calf. At 15 months old, a healthy young animal is about five feet high at the shoulders. The weight of a large adult male moose is between 1,100 and 1,200 pounds, but the maximum weight for the species would probably reach 1,500 pounds.

The range of the moose extends from Nova Scotia and New Brunswick to northern Alaska, a total distance along the axis of distribution of about 4,100 miles. This animal does not seem to have arrived in the United States, at least, before the final retreat of the ice of the last glacial age; and a somewhat different deer (see CERVALCES) probably preceded it.

The valley of the Ottawa River and its tributaries yet affords good hunting for moose, and so does northern Manitoba. The species still exists in small numbers in northern Minnesota, and along the western slope of the Rockies as far south as the head of Green River, Wyoming, (lat. 43°). Northward, moose are found in British Columbia, Alberta, Athabasca, Yukon and in many portions of Alaska. Those found on the Kenai Peninsula and north of Cook Inlet have the most massive and widespreading antlers to be found, and have even been described as an independent species, under the name of *Alces gigas.*

Everywhere throughout its range, the killing of moose is regulated by law. The open seasons are very short, the number that may be killed by each hunter is limited to one or two males, and the killing of females is forbidden. For the protection of the species in Alaska, Congress enacted in 1902 a stringent law, which will at least serve to prevent much of the reckless slaughter that up to that time had been proceeding. But, despite all laws that can be framed and enforced, the size of the moose, and its desirability, both as a hunter's trophy and for food, render it practically certain that the species will be destroyed far faster than it breeds, and that 25 years hence it will be as nearly extinct in America as the buffalo is today. Consult bibliography under DEER and ELK.

WILLIAM T. HORNADAY,
Director New York Zoological Park.

MOOSE-BIRD, one of the names in eastern Canada for the Canada jay. See JAYS.

MOOSE-FLY, a small biting fly (*Hæmatobia alcis*), parasites on the moose and very annoying to that deer in the Northwest. It is closely related to the horn-fly (q.v.).

MOOSE JAW, city in Saskatchewan, Canada. It is 398 miles west of Winnipeg and 420 miles east of Calgary, on the Canadian Pacific (divisional point), Canadian Northern and Grand Trunk Pacific railroads. Is a well laid out centre in a rich wheat-growing tributary region, situated in a valley at the confluence of the Moose Jaw River and Thunder Creek, and is a thriving agricultural and industrial town. There are government elevators with a total capacity of 4,000,000 bushels; flour mills, brick works, brass and iron works, and coal mines have been opened 40 miles south of the city. The city is well equipped educationally, and has a handsome Collegiate Institute; there is a general hospital and one under construction for the Gray Nuns. The street railway, electric power, light and waterworks are municipally owned. The population (1,558 in 1901) was 13,823 in 1911, and, according to the Dominion census of 1921 was 19,175.

MOOSE-WOOD, a local name in the Eastern States and Canada for either of two shrubby trees of whose leaves and twigs the moose is fond: (1) the striped maple or whistle-wood (see MAPLE); (2) leatherwood (see CYRILLA).

MOOSEHEAD, the largest lake in Maine, lies at an elevation of 1,026 feet on the boundary between Piscataquis and Somerset counties. It is about 35 miles long; its average width is about 7 miles and maximum 12. A number of rivers flow into the lake, and its direct outlet is Kennebec River. Part of its waters enters the Penobscot by way of a short stream and the lakes which are the source of the Penobscot. Game abounds, fish fill its waters and but few people inhabit the region near the shores. The Canadian Pacific Railroad passes along the southwest shore and connects the villages of Greenville and Moosehead.

MOOSE, Loyal Order of. A secret fraternal society founded in 1888 at Louisville, Ky., by Dr. J. H. Wilson. The first lodge was organized in Cincinnati, Ohio. The Supreme Lodge administers the society which comprises 1,610 subordinate lodges and has nearly 616,000 members. The society is beneficiary, furnishing the social advantages of brotherhood, and without obligation to buy life insurance or pledging to any specific cause, paying sick and funeral benefits. A home and vocational school for dependents and orphans of members of the society with suitable buildings are maintained on a farm of 1,000 acres at Mooseheart, near Aurora, Ill.

MOPSUS. (1) A seer, the son of Ampyx by Chloris, and one of the Thessalian Lapithæ, who died from the bite of a serpent which sprang from the blood of the Gorgon Medusa. (2) A legendary Greek prophet, son of Apollo and Manto, who vanquished Calchas in prophetic skill. Mopsus fell by the hand of the prophet Amphilochus. The name is also commonly used of the shepherd poets of Greek bucolic poetry, and hence of pastoral poetry generally.

MOQUEGUA, mō-kä'gwä, Peru, a province in the southern part of the republic, bounded on the north by the department of Arequipa, on the east by Puno, on the south by Chile and on the west by the Pacific Ocean. Area, 5,549 square miles. The eastern part is crossed by the Andes Mountains. The fertile portions are on the mountain slopes, the region along the coast is a rainless desert. The chief products are brandy and wine and there is considerable mineral wealth. Pop. 31,920. (2) Moquegua, the capital, is southeast of the centre of the province, was destroyed by earthquake in 1868. Pop. 6,125.

MOQUELUMNAN, a family of North American Indians, living in California and consisting of the Miwok and other tribes. The Moquelumnan family was originally included with the Costanoan in the so-called Mutsun, named after the language, or more probably the village, at the mission of San Juan Bautista. The Moquelumnan family, as at present generally recognized, consists of two detached divisions, the principal one occupying the territory in the San Joaquin Valley and on the slope of the Sierra Nevada; the other, a smaller territory on and near the coast north of San Francisco. The smaller division comprises three dialects, which are spoken in two separate areas: one near Clear Lake, the other north of San Francisco Bay. That spoken in the area near San Francisco is again divided into two dialects. The people of the principal division of the Moquelumnan family call themselves by some form of the name Miwok. They occupy one of the largest territories held by a single family in California, extending from the Consumnes River on the north to the Fresno and Chowchilla in the south. There are three well-marked Miwok dialects: one in the northern plains, the second in the northern and central hills and mountains and the third in the south. These dialects resemble the northern neighbors of the Miwok people — the Maidu — and not those of the Yokuts to the south. Consult Bărrett, S. A., ‹Geography and Dialects of Miwok Indians› (Berkeley, Cal., 1908), and Viroeber, A. L. (in *American Anthropologist,* Vol. VIII, Lancaster, Pa., 1906).

MOQUI (mō'kē) **INDIANS,** a semi-civilized tribe living in northern Arizona. The first accounts of them date from the expedition of Coronado in 1540. Their history is strikingly similar to that of the Indians of New Mexico, except that after a successful revolt against the Spaniards, in 1680, they remained independent. They are kind-hearted and hospitable, cultivate the soil, raising grain and vegetables, possess large flocks of sheep and goats and weave very fine blankets. The houses are built of stone, set in mortar, and for security are perched upon the summits of almost inaccessible mesas. They number about 1,600. See INDIANS.

MORA, mō'ra̤, **Francis Luis,** American artist: b. Montevideo, Uruguay, 27 July 1874. He studied art in the School of Drawing and Painting, Museum of Fine Arts, Boston, and the Art Students' League, New York. From 1892 he worked on illustrations for magazines and other periodicals, receiving his first important commission (1900) for a large decorative panel for the Lynn (Mass.) Public Library. In 1904 he did some decorative paintings for the Missouri State building and for the Saint Louis Exposition. He received the Sears prize, Museum of Fine Arts, Boston; Rothschild prize, Arts Students' League; gold medals from the Philadelphia Art Club (1901) and the American Fine Arts Society, Philadelphia (1902); a bronze medal from the Saint Louis Exposition (1904); 1st Hallgarten prize, National Academy of Design (1905); Beal prize, New York Water Color Club (1907); Evans prize and Shaw prize, Salmagundi Club (1908 and 1910); silver medal, International Fine Arts Exposition, Buenos Aires (1910). His works are displayed in the Boston Art Club; Lotos Club, New York; Art Gallery, Oakland, Cal.; Columbia University; State Gallery, Dallas, Tex.; National Academy Collection, New York, etc. Spanish influence is apparent in most of his creations, which show true coloring and due attention to detail; his figures are full of expression. Of his best works might be named ‹The Letter›; ‹The Mendicants› (1906); ‹Spanish Café› (1906); ‹After the Bull Fight, Granada› (1910); ‹Studio Tea› (1911); ‹Evening News› (1914).

MORACEÆ, a family of trees and shrubs (rarely herbs), related on the one hand to the elms and on the other to the nettles, whose botanical characteristics are: flowers unisexual, usually with four perigone leaves; stamens straight or inflexed in the bud; ovary dimerous, with one suspended, anotropous ovule; stipules caducous; juice milky. The species are mainly tropical and include the mulberries, figs, banyans, etc., bread-fruit, osage-orange, rubber or caoutchouc plants, upas tree (qq.v.) and others.

MORAINE, a deposit of sand, gravel or clay made by a glacier. Moraines may be divided into two classes, those that exist on the ice itself and those that are formed at the edge of or under the ice. Of the first type, the most common are the lateral moraines. These are ridges of débris that accumulate on the ice next to the rock wall on either side. They consist in part of material that the glacier has scraped from the valley sides and in part from avalanche débris. When two glaciers unite into one, two lateral moraines are brought together to form a medial moraine. Glaciers that result from many branches uniting may have several such medial moraines. The lower stagnant ends of many large glaciers are wholly covered with débris that was once frozen into the ice, but which has accumulated as the ice wasted away by melting. Such deposits are known as ablation moraines. Forests grow on the ablation moraine of the famous Malaspina Glacier in Alaska. Such moraines as the above three types seldom remain as distinct ridges after the glacier has melted away.

Of the second type, the frontal or terminal moraines are of the most importance. These are formed at the ice front, when loss by melting just equals ice advance, and all the débris is accumulated in one ridge. In the case of valley glaciers, these form dams across the valleys, often producing lakes. In the case of continental ice sheets the moraine may stretch for miles across the country as they do across our Northern States, at the southern margin of the glaciated region. Sometimes the ice in its retreat pauses several times, building a moraine at each pause, in which case they are called recessional moraines. The thin sheet of till (q.v.) that a glacier spreads over the country at large and which results chiefly from material that the ice is forced to drop from the bottom, due to overload, is called ground moraine. Drumlins (q.v.) are a special phase of ground moraine. Morainic débris is mostly unstratified and contains many polished and striated boulders. See also GLACIERS and the section on *Glaciology* in the article on GEOLOGY.

MORAIS, Sabato, American rabbi and educator: b. Leghorn, Italy, 13 April 1823; d. Philadelphia, 11 Nov. 1897. He was carefully trained in Hebrew lore, and taught first in Leghorn and then for a few years in London. In 1851 he came to Philadelphia and until his death was minister of the Mikve Israel Synagogue. In 1867 he was appointed professor of biblical exegesis in the short-lived Maimonides College of Philadelphia, and he was one of the founders and the first president of the Jewish Theological Seminary of New York. During nearly five decades of activity he was a representative of conservative Judaism, unremitting in his efforts in behalf of education and charity and an earnest and scholarly contributor to the Jewish press on historical, literary and theological themes.

MORAL EDUCATION. See Education, Moral.

MORAL PHILOSOPHY. See Ethics.

MORALES, Luis de, loo-ēs' dā mō-rä'lās, Spanish painter: b. Badajoz, about 1509; d. there, 1586. His early artistic life was spent in Andalusia, but he removed to Madrid in 1564, where he remained for the rest of his life, returning to his native city only to die. He was essentially Spanish in his conception of religious art, from his devotion to which he was called «El Divino.» The main theme of his paintings was the Dead Christ and the Mater Dolorosa. There is in them a blending of religious austerity with a sense of beauty which recalls the early Italian school, but his figures have the distorted and macerated air which later became the accepted type in Spanish religious paintings. His drawing is monotonous and mannered, and his modeling such as to attenuate into half skeleton proportions the limbs and features, but his coloring is of sweet and melting tenderness. The Madrid Museum has several examples of this master, namely, an ‘Ecce Homo,’ a ‘Mater Dolorosa’ and a ‘Madonna.’ A half-length figure of ‘Christ Bearing the Cross’ is in the Louvre under his name. An ‘Ecce Homo’ of his hangs in the Dresden Gallery, and one in that of the New York Historical Society.

MORALITIES, the name given a class of allegorical plays, so termed because they consisted of moral discourses in praise of virtue and condemnation of vice. The dialogues were carried on by such characters as Good Doctrine, Charity, Faith, Prudence, Discretion, Death, etc., whose discourses were of a serious cast. Moralities were occasionally exhibited as late as the reign of Henry VIII. The morality play, ‘Every Man,’ was performed by Ben Greet's company in America and England in 1902 and 1903. Consult Mackenzie, W. R., ‘English Moralities’ (New York 1914); Moore, ‘English Miracle Plays and Moralities’ (London 1907), and Pollard, A. W., ‘English Miracle Plays, Moralities and Interludes’ (5th ed., Oxford 1909). See Drama.

MORALITY. See Ethics.

MORAN, mō-răn', **Edward,** American painter: b. Bolton, Lancashire, England, 19 Aug. 1829; d. New York, 9 June 1901. He was a pupil of Hamilton and Weber in Philadelphia and in 1862 went to Europe, where he studied in France and England for seven years He afterward made his permanent home in New York. His best-known pictures are marines, such as ‘Outward Bound’; ‘Launch of the Life-Boat’ (1865); ‘The Coming Storm in New York Bay,’ etc. His historical series, representing epochs in American seafaring from the ‘Landing of Leif Ericson’ (1001) to ‘Dewey's Return,’ was completed in 1899 and exhibited at the Metropolitan Museum, New York, in 1904. He was a member of the National Academy.

MORAN, Patrick Francis (Cardinal), Australian Roman Catholic prelate: b. Leighlin Bridge, Carlow, Ireland, 16 Sept. 1830; d. Sydney, Australia, 16 Aug. 1911. He received his education at the Irish College, the Gregorian University and the Propaganda, Rome, and was ordained to the priesthood in 1853. He was successively vice-rector of the Irish College, Rome; professor of Hebrew at the Propaganda; vice-rector of the Scots College, and secretary to Paul, Cardinal Cullen, archbishop of Dublin. In 1872 he was consecrated titular bishop of Olba and made coadjutor to the bishop of Ossory. He succeeded to the diocese of Ossory in the same year and remained there until 1884, when he was appointed archbishop of Sydney, Australia. In 1885 he was made cardinal of the Roman Church with the titular church of Saint Susanna. He convened and presided at three plenary synods of the Church of Australia in 1885, 1895 and 1905, and also the Catholic congresses held at Sydney in 1900 and 1909. He was the author of ‘Memoir of the Venerable Oliver Plunkett’ (1861); ‘Essays on the Early Irish Church’ (1864): ‘History of the Archbishops of Dublin’ (1864); ‘History of the Persecutions of the Irish Catholics’ (1865); ‘Acta Sancti Brendani’ (1872); ‘Monasticon Hibernicum’ (1873); ‘Spicilegium Ossoriense’ (1874); ‘Irish Saints in Great Britain’ (1879); ‘Pastoral Letters of Cardinal Cullen’ (1882); ‘Occasional Papers’ (1890); ‘Letters on the Anglican Reformation’ (1890); ‘History of the Catholic Church in Australasia’ (1894); ‘Reunion of Christendom and Its Critics’ (1896); ‘The Mission Field in the Nineteenth Century’ (1900); ‘Three Patrons of Erin’ (1905); ‘Priests and People of Ireland’ (1905). He founded the *Irish Ecclesiastical Record;* edited it for some time and was a frequent contributor to its pages. He contributed to ‘The Catholic Encyclopedia.’

MORAN, Peter, American artist: b. Bolton, Lancashire, England, 4 March 1842; d. Philadelphia, 9 Nov. 1914. He belonged to an artistic family, being brother of Thomas Moran and of Edward Moran, both painters of reputation; he became their pupil at Philadelphia and chose landscape and animal life as his special department. Among his paintings are ‘Return of the Herd,’ to which a medal was awarded at the Centennial Exhibition; ‘Santa Barbara Mission’; ‘Pueblo of Zia, New Mexico.’ He was also successful as an illustrator and etcher and at the Centennial of 1876 received a medal for his etchings of animals.

MORAN, Thomas, American artist: b. Bolton, Lancashire, England, 12 Jan. 1837. He came to the United States with his parents in 1844, was educated in the public schools of Philadelphia and studied painting in that city, first exhibiting in the Pennsylvania Academy of Fine Arts in 1856. In 1862 he visited England and at this time formed his great and lasting admiration for the work of J. M. W. Turner, the English landscape painter. In 1871 he accompanied the F. V. Hayden expedition to the Yellowstone country and on his return painted ‘The Grand Canyon of the Yellowstone,’ which was purchased by the government for the Senate Hall in the Capitol. He made a trip to Arizona in 1873 and the result was ‘The Chasm of the Colorado,’ also bought by the government. He made many other expeditions into the western country and Mexico, also to

Europe and painted many canvasses of Venice. About 1873 he removed to New York and at this time did an enormous amount of drawings on wood for magazine illustration and for schoolbooks. He also did much etching. He is a member of the National Academy of Design, the American Water Color Society and similar societies. Other important works from his hand are ‘Mountain of the Holy Cross’; ‘Shoshone Falls’; ‘The Grand Canal, Venice’; ‘The Pearl of Venice’; ‘The Dream of the Orient’; ‘Solitude,’ etc.

MORANT, mō-rănt, Sir **Robert Laurie,** English educator: b. London, 7 April 1863; d. 13 March 1920. He was educated at Winchester, and at New College, Oxford; B.A. 1885. He undertook educational work of several kinds, becoming tutor to the royal family of Siam and organizer of education in that country. He then took up social and educational work in East London, becoming (1895) assistant director of special inquiries and reports in the Educational Department, Whitehall, which included education reports on England, France and Switzerland, etc. He was appointed Permanent Secretary, Board of Education, 1903–11, and was chairman of the Insurance Commission after 1912. He was created Knight Commander of the Bath in 1902.

MORAT, mō′rą′, Switzerland, town in the canton Fribourg, located on Lake Morat and on the Palézieux-Lys and the Ins-Fribourg railways. It has a 13th century castle, but is chiefly noted for the brilliant victory of the Swiss and their confederates over Charles the Bold, 22 June 1476. Consult Ochsenbein, ‘Die Urkunden der Belagerung und Schlacht von Murten’ (Basle 1876).

MORATIN, mō′rą-tēn, **Leandro Fernandez,** Spanish dramatist: b. Madrid, 10 March 1760; d. Paris, 21 June 1828. He was son of Nicolas (q.v.) and was early instructed in poetic art, and (1786) went to Paris as secretary of Count Cabarrus, where he gained the acquaintance of Goldoni who strengthened his purpose of reforming the Spanish stage by introducing French rules. Returning (1789) to Spain he was granted a benefice by Minister Florida-Blanca which permitted him to follow a literary life. His first comedy, ‘El viejo y la niña (1790) was successful and it was followed by the satyric play ‘La comedia nueva (1792) which revenged him for the opposition given him by the old adherents to the national taste. Prince Godoy afforded him the means to visit France, England, Germany, Switzerland and Italy, returning in 1796. Next year appeared his ‘Elbaron,’ ‘La mogigata,’ ‘El sí de las niñas,’ the latter proving an immense success and soon being translated into various languages. Under French occupation he accepted (1811) the post of librarian to King Joseph for which persecution drove him to exile and he settled (1822) in Paris. His plays have their characters drawn true to life, the dialogues are lively and these works show originality. Concerning the history of Spanish drama he wrote ‘Origenes del teatro español,’ a worthy work. The Spanish Academy published his operas (Madrid 1830–31) and the ‘Biblioteca de autores españoles’ (ib. 1867) published his ‘Obras postumas.’ Consult also Ford, ‘Si de las niñas’ (Boston 1899).

MORATIN, Nicolas Fernandez, Spanish poet and dramatist: b. Madrid, 20 July 1737; d. there, 11 May 1780. He studied law at Valladolid, devoting time also to fine arts, and received a position in court after finishing his studies. He first turned to the drama, starting with the play ‘La petimetra’ (1762), attempting to combine his national taste with that of the French. Next came ‘El poeta’ and the tragedy ‘Lucrecia’ in orthodox style which he held to in his later ‘Hormesinda’ and ‘Guzman el Bueno.’ The small income he derived from his literary work decided him (1772) in taking up the work of attorney-at-law, but he was soon made professor of poetry. His last and superlative work was ‘Canto epico de las naves de Cortez destruidas’ (1785), one of the finest of the Spanish heroics. His son Leandro edited a collection of some of his works under the title of ‘Obras póstumas’ (Barcelona 1821), but a more extended collection appeared in ‘Biblioteca de autores españoles’ (Vol. II, Madrid 1848), printed later in Paris (1881). R. Foulcké-Delbosc published his remaining works under title of ‘Poesias ineditas’ (Madrid 1892).

MORAVA, mō′rä-vä, Serbia, a river about 250 miles long, formed by the confluence at Staladsh of its head streams, the western Morava rising near the southwest boundary, and the southern Morava, with its source in Kossovo, Turkey. It is the largest river in Serbia and is navigable 50 miles from its mouth in the Danube River, 30 miles east of Belgrade.

MORAVA, a river of Austria-Hungary. See March.

MORAVIA (German, *Mähren*), Czecho-Slovakia, a province of the new state, bounded north by Prussia, northeast by Galicia, east and southeast by Hungary, south by Hungary and Austria and west by Bohemia; area, 8,584 square miles. Moravia proper consists of a large basin surrounded by mountains, on the north the Sudetes, on the east the Carpathians and on the west a low range of hills which gradually ascends toward the north until it unites with the Sudetes and open only on the south, at a central point, toward which all its slopes converge and all its drainage is carried. Its climate is milder and more genial than that of most European countries under the same latitude, the mean at Brünn being 48° F. Moravia belongs to the basin of the Danube, all the smaller streams falling into the March or Morava, a tributary of the Danube. About 55 per cent of the land is arable and 27 per cent is occupied by forests. The minerals are of considerable importance and include silver, lead, copper, iron, coal, graphite, etc. The soil is generally fertile and all the ordinary cereal, leguminous and root crops are raised in abundance. Flax of excellent quality is extensively grown in several districts and fruit is so abundant that many parts of the country have the appearance of one great orchard; but the favorite culture is that of the vine, for which both the soil and exposure of the province are admirably adapted. The pastures, in general excellent, occupy a large extent of surface. The rearing of cattle, nevertheless, gets comparatively little attention and is not sufficient to meet the home demand. Sheep, on the other hand, are reared in abundance and are of good quality. They have been much improved by judicious crossing with the merino and furnish a wool, to the excellence of which the woolen manufactures of the country owe their prosperity. The horses, too, are of a strong, hardy, active breed and were much used in the Austrian service for heavy cavalry. Manufactures have made great progress and in all the great branches of industry — in iron and ironmongery, leather, linen, cotton and woolen tissues, particularly the last — Moravia takes precedence of most of the provinces of the state. Other manufactures deserving of notice are silk, glass, paper, potash, tobacco and beet-root sugar. The trade in most of these articles is of considerable importance. The waterways are unimportant. About 71 per cent of the inhabitants are of Slavonian extraction and 28 per cent Germans, the latter found mostly in the towns and on the borders. The language chiefly spoken and called Moravian is merely a Slavic dialect; German, however, is generally understood by all classes. The religion almost universally professed is Roman Catholic (97 per cent) and 2 per cent are Jews. Elementary education is generally diffused and numerous gymnasia furnish education of a very superior order. There are theological colleges at Olmütz and Brünn, the latter city the capital of the province (pop. 125,737). Moravia was anciently inhabited by the Marcomanni and Quadi, afterward by the Rugii, and still later by the Longobardi. It was finally occupied by a colony of Slavs, who took the name of Moravians from the river Morava. In 1029 Moravia was united to the kingdom of Bohemia, with which it had the same constitution, administration and laws. In 1197 it was erected into a margraviate, with a separate court and a separate administration. With Bohemia it passed to the house of Austria in 1527. In 1849 it was separated from Bohemia and erected into a distinct province. Moravia subsequently sent 49 members to the Austrian House of Deputies and the provincial diet was composed of 151 members, the majority elected by nationalities German and Bohemian. Proportional representation was introduced in 1905. Pop. 2,622,271. On 28 Oct. 1918, Moravia united with Bohemia, Slovakia and Silesia to form Czech-Slovakia. Consult Monroe, W. S., ‘Bohemia and the Czechs, together with an Account of Moravia and Silesia’ (Boston 1910).

MORAVIAN CHURCH, The, the common name given in England and America to the renewed Unitas Fratrum or Church of the Brethren — for a time styled also in English the Church of the United Brethren — which originally flourished in Bohemia, Moravia and Poland, was disrupted and suppressed in the 17th century, was resuscitated in Saxony in the 18th century and at present exists in its reorganized form in Europe and America with an extensive mission work in many parts of the world. It was a product of the evangelical movement led by the Bohemian reformer, John Hus, who suffered martyrdom at Constance, 6 July 1415. It developed out of an association formed in 1457 near Kunwald in northeastern Bohemia to foster pure Christian teaching and life within the National Church. Its attitude toward the abuses of the time and its rapid growth caused it soon to be put under proscription by the authorities. Drastic measures intended to suppress and disintegrate it had the contrary effect. It formed a more compact union, perfected its organization and gradually became a distinct church with its own ministry, established through the good offices of Waldensian bishops who conveyed the historic episcopate to it in 1467. A system was developed which followed primitive Christianity in its elementary principles. It began with the congregation as the unit, based on Scripture, bound by a Brotherly Agreement and governed by an elected eldership. With the increase of congregation, the Synod was formed, legislating by delegated authority. The Synod committed executive control to the Council which was also elective and representative, for while the episcopacy stood at the head, the presbytery and the laity had a voice in it, with the central principle of conferential government and collegiate administration fixed. This principle, inherited with the ancient episcopate, is cardinal in the modern structure of the Church, adjusting together conceptions of polity commonly regarded as opposites and presenting affinities to widely divergent church types.

Its history during the ancient period is to a great extent one of cruel persecution. Its speedy recuperation after such ordeals and its increase during intervals of peace were phenomenal. When the German Reformation began in 1517, the Bohemian and Moravian Brethren numbered nearly 200,000 with about 400 places of worship. In the baronial castle and in the peasant's cottage loyalty to their Church, which embodied the best ideals of the nation, rendered them amenable to a discipline in which they stood pre-eminent and made them a strong moral power to be coped with by ecclesiastical and political authorities. In their highest ascendency they led the educational and literary activity of the regions in which they were established. Their formulated conceptions of Christian doctrine were a gradual growth. Their last and most mature confession of faith before the overthrow of the Church in its original seats was published in 1573.

The Counter-Reformaion inaugurated by Ferdinand II in 1621 brought the organized existence of the Church to an end in Bohemia and Moravia, subjected many of its members to martyrdom and drove thousands into exile. It was excluded from the terms made to other evangelical parties in the Peace of Westphalia which ended the Thirty Years' War in 1648, and the hope of its resuscitation in its home-lands was crushed. The parishes of its Polish province, founded in 1548, maintained an organized existence much longer, but they were gradually absorbed by the Reformed Church of Poland of which ultimately even the clergy in whose persons the episcopate of the Unitas Fratrum was being perpetuated in the hope of its renewal were legally recognized ministers.

The first step in the restoration of the Church occurred in 1722, when a little company of refugees from Moravia were given an asylum by Nicholas Lewis, Count of Zinzendorf, on his estate, Berthelsdorf, in Saxony where, on 17 June of that year, they began a settlement which was called Herrnhut. Many others from Moravia, Bohemia and different parts of Germany joined them during the next few years, and a gradual process of organization took place in which the plans of the Moravians were merged with those of Zinzendorf who had in view rather an evangelical association harmonizing different confessional affiliations and Church traditions, with the necessary adaptation of the whole to its situation within the pale of the state church. The doctrinal articles of the Augsburg Confession were adopted and concessions from the Saxon and Prussian governments permitted the establishment of Moravian Church order and constitution modified to suit the new conditions.

The Moravian episcopate was transferred to the new organization on 13 March 1735, when David Nitschmann was consecrated a bishop at Berlin by Bishop Daniel Ernst Jablonsky with the written concurrence of Bishop Christian Sitkovius of Lissa, they being the last two surviving bishops of the old line. A notable spiritual experience which marked the year 1727, when the first definite organization took place at Herrnhut, produced an intense zeal for evangelization. The result, during the next few years, was the establishment of other congregations on the continent of Europe, the founding of the Church in England and America and missions to the heathen which have chiefly given the Church its reputation. The first such mission was begun in 1732 on the island of Saint Thomas, West Indies.

The first Moravian evangelist came to Pennsylvania in 1734. The first settlement in America and mission to the Indians was founded at Savannah, Ga., in 1735. Untoward political conditions caused its abandonment in 1740 and the removal of the colonists to Pennsylvania, where a permanent settlement arose in the present Northampton County, with organized activity in Philadelphia and New York and an extensive itinerary among white settlers and Indians. The Moravian pioneers in «the Forks of the Delaware» first located on a tract of land which the evangelist George Whitefield had purchased and named Nazareth, where he proposed to found a village and a negro charity school. This property came into possession of the Moravian Church in 1741. On another tract at the confluence of the Monocacy Creek and the Lehigh River its chief settlement was founded in that year and at Christmas 1741, when Count Zinzendorf was at the place, it received the name Bethlehem. In June 1742, a considerable colony from Europe joined the pioneers and the settlement was regularly organized. The population was divided into an itinerant and a local congregation, the former to engage in gospel work among white settlers and Indians, the latter to develop the settlement and provide support for the missionaries. Thus, from the first, Bethlehem was the centre of the Moravian Church in America and of its various activities.

Until 1762 a co-operative union was maintained at Bethlehem and Nazareth which was called the General Economy. All labored for a common cause and received sustenance from a common stock, but there was no surrender of private property and no obligation which prevented the individual from withdrawing when he chose. Numerous colonies came to America during those years on vessels owned and managed by the Church and under the arrangement which existed results were accomplished which would not otherwise have been possible. The material benefits of the settlement were appreciated by the authorities of Pennsylvania, and the spiritual activities prosecuted by the Moravians, although misunderstood and opposed by some, as was the case also in Europe, were epoch-making in the religious growth of the country.

Two notable lines of effort in colonial times, in addition to the Indian missions, were the propagation of Zinzendorf's idea of evangelical alliance and denominational federation, and religious education of children. Desiring to diminish rather than increase denominational divisions the leaders of the Church generally refrained from organizing distinctly Moravian congregations and in consequence of this policy the Moravian Church remained numerically a small body. The European plan of the Church to concentrate in exclusive settlements to some extent was followed for a full century. Besides Bethlehem and Nazareth, such church-villages, founded prior to the Revolutionary War, were Lititz in Lancaster County, Pa., Hope in Sussex, now Warren County, N. J.,—abandoned in 1808 — and Salem, now a part of Winston-Salem in Forsyth County, N. C., the central settlement on a large tract of land purchased of the earl of Granville and named Wachovia. These places continued long to be conserving centres of all that was distinctive in the religious and social life of the Moravian Church, as fostered under the influence of Zinzendorf's ideas and methods, presenting interesting experiments in municipal government, industrial order and general culture. They are yet the seats of widely known educational institutions, all founded in the 18th century. A few of the town and country congregations organized in colonial times, without the peculiarities of the church settlements, are yet in existence. During the years from 1844 to 1856, the exclusive system was entirely abolished by all of the Moravian villages in America and their unique character rapidly disappeared. At that period active home mission work was revived and since then many congregations have been founded in various parts of the United States. The most fruitful of these efforts have been in several of the Northwestern States.

The Moravian Church has no peculiar doctrines. It is simply and broadly evangelical, in harmony with other Protestant denominations on the cardinal doctrines of Christianity, and bound by no articles on the points of difference. Its only prominent doctrinal feature is the strongly Christ-centred tendency of its teaching which pervades its official statements, its liturgy and its characteristic preaching. The digest («Results») of the General Synod, the catechisms and the Easter Morning Litany sufficiently set forth the doctrinal position of the Church. The Church has an established liturgical system, with a litany used regularly on the Lord's Day, and a variety of offices for different Church seasons, in which special prominence is given to singing; the cultivation of church music having always been a conspicuous feature of the Moravian cultus. The general order of the ancient church year is observed in the services. Of distinctive services retained by some congregations, the love-feast, introduced in 1727 in imitation of the Agapæ of the Apostolic Church, is the most conspicuous. Moravian orders of the ministry are bishops, presbyters and deacons. A diocesan episcopacy does not exist. The bishops are, as such, everywhere on a parity, representing the entire Unitas Fratrum. They are ex officio members of the General Synod and of the synods of the several provinces in which they reside. Besides having the exclusive function of ordaining men, they are looked to as pre-eminently the guardians of sound doctrine and established order. In governing boards they officiate, not by virtue of episcopal authority, but by election, and those who do not occupy executive positions serve, meanwhile, in pastorates. The Moravian Church in America is divided into a Northern and a Southern province, constituting, with the British and German branches of the Church, an organic unity under the General Synod. The legislative authority of each province is the Provincial Synod which elects an executive board known as the Provincial Elders' Conference and composed usually of a bishop and two presbyters. The Northern province is divided into districts, each organized with its synod and its executive board. The communicant membership of the American Church in 1922 was 24,098 and its total 34,751. The enrolment in the 14 mission provinces of the Church was 105,169 and its grand total in all countries was 227,171, besides 70,000 members of the state churches of Europe, ministered to by Moravian home missionaries.

Bibliography.— Cröger, ‹Geschichte der erneuerten Brüderkirche› (Gnadau 1854); Gindely, ‹Geschichte der böhmischen Brüder› (Prague 1857); id., ‹Ueber des Johann Amos Comenius Leben und Wirksamkeit› (2d ed., Znaim 1893); de Schweinitz, E. A., ‹History of the Unitas Fratrum› (Bethlehem 1885); Schwarze, W. N., ‹John Hus, The Martyr of Bohemia› (New York 1915). For the history of the Church in the United States consult Carroll, H. K., ‹Religious Forces in the United States› (New York 1912); Hamilton, J. T., ‹History of the Moravian Church in the United States› (New York 1895); id., ‹History of the Missions of the Moravian Church› (Bethlehem 1901); Reichel, ‹Early History of the Church of the United Brethren in North America› (Nazareth 1888); Schwarze, ‹History of the Moravian College and Theological Seminary› (Bethlehem 1909); Clewell, ‹History of Wachovia in North Carolina.›

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MORAVIAN SEMINARY AND COLLEGE FOR WOMEN, at Bethlehem, Pa., founded almost at the beginning of the Moravian settlement of Bethlehem (1741), it is the second oldest girls' boarding school in the United States, the Ursuline Academy, New Orleans (7 Aug. 1727), being the first. «Colonial Hall,» built in 1748, is the oldest structure in the group of buildings owned by the seminary. From the roof of this building it was customary in pre-Revolution days to play the trombone on festal occasions or to announce the death of members. Tradition says that on one occasion during the French and Indian War a band of Indians had planned to attack the settlement, and at sunset as they lay waiting on Calypso Island, for the darkness, they heard a strange melody floating down from the sky. They had never heard anything like it before, and thinking it must be the voice of the Great Spirit warning them, they held a hurried council, and silently stole away in the darkness. In 1776–78, «Colonial Hall» served as a military hospital for the Continental troops. After the battle of Brandywine the place was crowded with wounded. On the slope of the hill, just west of Monocacy Creek, are the graves of over 500 of unknown dead. Many of the distinguished women of the nation have graduated at this institution. A preparatory school, music, art and science departments are connected with the seminary, and 10 years ago a fully accredited college course leading to A.B. and B.S. degrees was added, and is recognized by the College and University Council of Pennsylvania. The average attendance is about 200, the number of teachers 20.

MORAVIANS. See Moravian Church.

MORAWETZ, mŏr'ạ-wĕts, **Victor,** American corporation lawyer: b. Baltimore, 3 April 1859. He studied at foreign universities, and received the degree LL.B at Harvard (1879), and was admitted to the bar in 1880. In his practice of law he has acted chiefly in the capacity of counsel for railway and other corporations. He was general counsel, director and chairman of the board of directors of the Atchison, Topeka and Santa Fé Railway Company, and is now director and member of the executive committee of the Norfolk and Western Railway Company, as well as director in other corporations. He was made LL.D. in 1914 by Williams College. He wrote ‹Law of Private Corporations› (1882); ‹Banking and Currency Problem in the United States› (1909).

MORAY, mŭr'rē, **Earl of.** See Stuart, James, Earl of Murray or Moray. More correctly Stewart: it was Mary Queen of Scots who adopted the latter spelling Stuart.

MORAY FIRTH, Scotland, a large bay on the northeast coast, containing at its widest extent the sea enclosed by a line running from Dunscansby Head in Caithness-shire to Kinnaird Head in Aberdeenshire. It thus comprises the Dornoch Firth and the inner Moray Firth, to which the name is more strictly applied, the entrance to which lies between Tarbet Ness in Cromarty and Burghead in Elginshire, and which gives off Cromarty Firth and Beauly Firth and Loch. The opening of the outer firth to the North Sea is 80 miles in width. The rivers which enter the firth include the Deveron, Spey, Findhorn, Ness, Beauly, Oykel.

MORAYS, eel-like fishes of the family *Murænidæ*. There, says Jordan, may be distinguished by the small round gill openings and the absence of pectoral fins. The skin is thick and tough, the narrow jaws are armed with knife-like or else molar teeth, and the lower one is moved by muscles of extraordinary size and power. They are carnivorous and pugnacious fishes, and some of them, which reach a length of five or six feet, may be dangerous to bathers and fishermen. They abound in the tropics, lurking in the crevices of rocks, coral reefs and similar places, and most of them are colored in striking patterns, as fine marblings of black or lustrous green, or varied spottings.

Several genera and more than 100 species are known, of which a celebrated type is the murræna (*Murœna bellina*) of the Mediterranean Sea, which was extensively cultivated by the Romans, in the classic period, for the sake of its flesh. Two or three species are well known as food-fishes on both coasts of tropical America, and one, usually called «conger,» is similarly utilized in southern California.

MORAZAN, Francisco, frän-sēs′kō mō-rä-sän′, Central American soldier and politician: b. Tegucigalpa, Honduras, 1799; d. San José, Costa Rica, 15 Sept. 1842. He early entered political life and in 1824 was secretary-general of Honduras; when Honduras and Salvador revolted against President Arce of Central America, Morazan came rapidly to the front as a military leader, and in 1830, after a series of brilliant military exploits, was elected President of the Central American Confederation. Though a wise ruler, his administration was interrupted by several revolts. At the close of his second term it was found that no provision had been made for electing his successor, and in spite of his efforts the union of the states of Central America was dissolved and he himself compelled to find refuge in Peru. In 1842 he landed in Costa Rica, proclaimed the federation of the states, and after defeating Carillo assumed the Presidency at San José. A revolution followed directed against his federal proclivities and he was captured and shot. Consult Bancroft, ‹History of Central America› (Vol. III, 1887).

MORDANT, *in dyeing,* a substance which is capable of penetrating the fibres of the substance that is to be colored, or of forming an insoluble deposit upon them, and which also forms an insoluble compound with the dye that is to be used. Mordants vary greatly in character, according to the nature of the dye and of the fabric. They may be classified, however, as «acid» and «basic»; an acid mordant being required to fix a basic dye and a basic mordant to fix an acid dye. Tannic acid is a typical example of an acid mordant. Cotton may be mordanted with this substance by soaking it in a solution of tannic acid and then passing the fabric through a solution of a salt of antimony, tin or some other suitable base, by which the tannic acid is fixed upon the fibre in the form of an insoluble tannate, with which the dye subsequently combines. The acetates and sulphates of aluminum and of iron may be cited as examples of basic mordants. Wool may be mordanted, for example, by boiling it in a dilute solution of such a salt (usually with the addition of certain other substances, such as cream of tartar or oxalic acid), the wool causing the mordant to partially dissociate, so that a more basic compound is deposited upon and within its fibres, while a more acid one remains in solution. Wool, when treated in this way, will fix dyes (such as alizarin) that are of a phenolic character. See DYEING.

MORDECAI, môr′dĕ-kī, **Alfred,** American engineer: b. Warrenton, N. C., 3 Jan. 1804; d. Philadelphia, 23 Oct. 1887. Graduating at the head of his class from West Point in 1819, he became 2d lieutenant of engineers, and after work as instructor at West Point and assistant engineer was appointed captain of ordnance corps 30 May 1832. He was assistant to the chief of ordnance at Washington (1838–42) and member of the ordnance board (1839–60). Brevetted major (1848) for meritorious conduct in the Mexican War, he was sent to the Crimea (1855–57), his observations on military organization and ordnance being published by order of Congress in 1860. He resigned from the service in 1861, settling in Philadelphia, where, after acting as assistant engineer of the Mexican and Pacific Railroad (1863–66), he became (1867–87) treasurer and secretary of canal and coal companies controlled by the Pennsylvania Railroad. Among his works are ‹Digest on Military Laws› (1833); ‹Reports of Experiments on Gunpowder› (1845–49); ‹Artillery for the United States Land Service,› as devised and arranged by the Ordnance Board with plates (1849); ‹Ordnance Manual for the Use of Officers of the United States Army› (1841 and 1850).

MORDECAI, Alfred, American engineer, son of the preceding: b. Philadelphia, 30 June 1840; d. 20 Jan. 1920; graduated, West Point (1859); and brevetted 2d lieutenant, topographical engineers. After service on the field (June–August 1861) he taught at West Point for nearly a year and then was promoted until he became chief of ordnance, Department of the South (1863–64). From May to September 1864 he was chief of ordnance, Army of the James, later holding similar office in the Army of Ohio, Army of the Cumberland, and military division of the Tennessee. Brevetted lieutenant-colonel for services in the war (13 March 1865), he was instructor of ordnance and gunnery at West Point 1865–70, and again 1874–81. He was commander, with rank of colonel, of the Benicia (Cal.) arsenal, 1899–1902; promoted brigadier-general and retired in January 1904.

MORDENITE, a native hydrous silicate of aluminum, potassium, sodium and calcium, occurring in small monoclinic crystals, or in small hemispherical concretions with a fibrous structure. It is white, or nearly so, with a vitreous lustre. Mordenite occurs at Morden, N. S., and in western Wyoming.

MORDVINS, môrd′vĭnz, a race of people scattered over the Volga provinces of European Russia and to the south and east of these, and belonging to the Ural-Altaic family. There are two distinct groups, the Ersh or northern and the Moksha or southern, with differences in feature, and the latter of darker hue. They are a well-built, hardy race, and superior to the Russians by whom they are surrounded. Their chief sources of livelihood are cattle-rearing, hunting, fishing and bee-keeping, and they are famous as carpenters and woodworkers. They are nominally Christians, the work of conversion beginning at the time of the Empress Anna; but their Christian beliefs have been superimposed on remains of the old pagan worship. Pop. about 1,000,000.

MORE, mōr, **Hannah,** English moralist: b. Stapleton, near Bristol, 2 Feb. 1745; d. Clifton, near Bristol, 7 Sept. 1833. She was educated in the seminary in Bristol kept by her elder sisters, and her talents early made her acquainted with Johnson, Burke, Garrick and other literary men of the period. Her first success was as a dramatic writer. ‹The Inflexible Captive›; ‹Percy›; and ‹The Fatal Captive› were successfully brought out through the patronage of Garrick and her other friends. After the production of the last in 1779 she gave up playwriting from religious motives, and devoted herself to writing works of a moral and religious tendency, the diffusion of tracts and other philanthropic labors. In this new course her talents commanded an extraordinary measure of success. A series of tracts called the ‹Cheap Repository,› commenced at Bath in 1795, is said during the first year to have had a circulation between 1,000,000 and 2,000,000 copies, and led to the foundation of the Religious Tract Society. Her most popular fiction, ‹Cœlebs in Search of a Wife› (1809), ran through eight editions in the course of a year, and passed through 30 editions in America. Sydney Smith's hostile review of this work in the *Edinburgh* is highly diverting. Her works include ‹Strictures on the Modern System of Female Education› appeared in 1799, followed by ‹Hints Towards Forming the Character of a Young Princess› (1805); ‹Practical Piety› (1811); ‹Christian Morals› (1813); ‹Character and Writings of Saint Paul› (1815); ‹Moral Sketches, with Reflections on Prayer› (1817). Consult Roberts, ‹Life of Hannah More› (1838); Thompson, ‹Life of Hannah More› (1838); ‹Correspondence of Hannah More with Zachary Macaulay› (ed. by Roberts, 1860); Yonge, C. M., ‹Hannah More› (1888); Harland, Marion, ‹Literary Hearthstones: Hannah More› (1900).

MORE, Louis Trenchard, American educator: b. Saint Louis, 9 April 1870. He studied at Johns Hopkins taking (1895) the degree Ph.D. He was instructor of physics (1896) at Worcester Polytechnic Institute and was appointed instructor and adjunct professor of physics at the University of Nebraska (1896–1900), becoming professor of physics (1900) and dean (1910–13). He was dean of the Graduate School (1916) at the University of Cincinnati. He has written ‹The Limitations of Science› and contributed many articles to the technical press on such subjects as light, electricity, magnetism, ionization and sound.

MORE, Nicholas, English colonist: b. England: d. Philadelphia, Pa., 1689. He was a physician and left a promising career in England to come with William Penn to America in 1682. He was from the first prominent in the affairs of the colony, was president of the first assembly in 1682 and in that year presiding judge of the courts of Philadelphia. In 1683 he was clerk of the provincial council and the next year was speaker of the assembly. He was appointed first chief justice of the Supreme Court of the province in 1684, and in this position incurred the disapproval of the colony and was impeached for having wielded «an unlimited and arbitrary power.» He retained the confidence of Penn, however, who appointed him in 1686 one of the five commissioners in control of the government.

MORE, Paul Elmer, American author: b. Saint Louis, Mo., 12 Dec. 1864. He was graduated at Washington University in his native city in 1887, studied later at Harvard and was instructor in Sanskrit there for a year and subsequently at Bryn Mawr for two years. He was literary editor of the *Independent,* 1901–03, and of the New York *Evening Post,* 1903–14. He also was editor of the *Nation* from 1909 to 1914. To it he contributed many valuable reviews and essays in literary criticism. His fine scholarship and effectiveness of method have placed him in the front rank of American literary critics. He has published ‹The Great Refusal›; ‹A Century of Indian Epigrams: chiefly from the Sanskrit of Bhartrihari› (1898); ‹The Judgment of Socrates›; ‹Life of Benjamin Franklin›; ‹Translation of the Prometheus Bound of Æschylus›; ‹The Jessica Letters,› with Corra Harris; ‹Shelbarne Essays› (9 vols., 1904–13); ‹Nietzsche› (1912).

MORE, Sir Thomas, English statesman and author: b. London, 7 Feb. 1478; d. there, 6 July 1535. In 1492–94 he studied at Canterbury Hall, now Christ Church, Oxford, and in 1494 was a student in Lincoln's Inn. At 21 he obtained a seat in Parliament, and distinguished himself with spirit in opposition to a subsidy demanded by Henry VII. After being admitted to the bar he enjoyed great reputation as a pleader. In 1516 he accompanied the commissioners sent to renew the alliance between Henry VIII and Charles, then Archduke of Austria, and showed much ability. In 1516 he published his celebrated political romance ‹Utopia.› Cardinal Wolsey pressed him to receive a pension, which he refused as inconsistent with his official duties; but he was induced to accept the place of master of requests. He was shortly after knighted, and taken into the Privy Council. In 1521 he was appointed treasurer of the exchequer, and in 1523, at the instance of Wolsey, was elected speaker of the House of Commons. He was joined with Wolsey in a mission to France in 1527 and on his return made Chancellor of the Duchy of Lancaster. In 1529 he succeeded the cardinal as Lord High Chancellor, which office he filled for three years with scrupulous integrity, but he was severe in his punishments for heretical opinions. Unable to acquiesce in the king's wishes respecting his divorce from Catherine of Aragon, he obtained permission to resign the seals. The affront rankled in the mind of Henry, and was further inflamed by his refusal to attend the coronation of Anne Boleyn. An attempt made to implicate him in the practices of Elizabeth Barton altogether failed; and he also perfectly cleared himself of the charge of inducing the king to publish the book against Luther, in which the Pope's authority was held forth — a doctrine now found inconsistent with the intended attack on the Roman See. The king was declared supreme head of the Church in 1534; but More steadily refused to recognize any other head than the Pope, declined to take the oath of supremacy and was consequently committed to the Tower and indicted for treason. After an imprisonment of 12 months, he was brought to trial, and despite his eloquent defense condemned and sentenced to be hanged and quartered. The king altered the sentence from hanging and quartering to beheading, and this act of grace More received with his usual vein of humor. While in prison he wrote a ‹Dialogue of Comfort against Tribulation› and a treatise on Christ's passion. At his execution he comported himself with dignity and with a great degree of good humor. The news of his death startled Catholic Europe, and British ambassadors were instructed to explain that all was done by due legal process. More's learning was varied and extensive, his wit abundant and his elocution ready and agreeable. He wrote elegant Latin prose and verse, and a terse and simple English. His 'Utopia' is a classic of literature, and he, one of the brightest spirits of the Renaissance. The second degree of beatification, that of Blessed, has been conferred on More by the Roman Catholic Church. His English works were published collectively, in 1557, and his Latin in 1567. (See UTOPIA). Consult the 'Life' by Roper (1626, reprinted 1716), and Stapleton's 'Tres Thomae' (1588), the principal sources; and the biographies or studies by Bremond (Eng. trans. with bibliography, London 1904); Bridgett (ib. 1891); Campbell's 'Lives of the Chancellors' (ib. 1845–48); Sir Sidney Lee's 'Great Englishmen of the 16th Century' (ib. 1904); Manning's 'Household of Sir Thomas More' (ib. 1851) and 'The Book of Sir Thomas More' in 'Malone Society Reprints' (ib. 1911).

MOREA. See PELOPONNESUS.

MORÉAS, mō′rā′ą′, **Jean,** French poet and author: b. Athens, 15 April 1856; d. 1910. His real name was Jean Papadiamantopulos. He was sent to Paris to study law but, from 1882, devoted himself entirely to poetry. His poems, 'Les Sytres' (1884) and 'Les Cantilènes' (1886), made him one of the most prominent representatives of symbolism. In the novel, 'Le Thè chez Miranda' (1886), so hard to understand, he tries to bring prose under the same new tendency. His poem, 'Le Pélerin passionné' (1891), shows a happy leaning toward Ronsard. The six books of 'Stances' (1905) contain most of his more perfect works. He wrote a version of Euripides' 'Iphigenia in Aulis' (1903) in semi-archaic language, which was produced at the Odéon, Paris, with success. Consult Gourmont, J. de, 'Jean Moréas' (Paris 1905).

MOREAU, mō-rō, **Gustave,** French painter: b. Paris, 1826; d. there, April 1898. He began his career under the influence of Delacroix, but on going to Rome he chose as his especial subjects of study the fantastic architectural effects of Mantegna and the dramatic composition and sometimes violent poses of Luca Signorelli. His works show the characteristics of these masters and are eminently original both in design and coloring, though little known until the latter days of his life, as he seldom exhibited until he was past 40, or offered his works for sale. On his death he left upward of 800 canvases to the municipality of Paris to form the Musée Moreau. In 1892 he was appointed professor in the Ecole des Beaux-Arts and held the position till his death. He was made an officer of the Legion of Honor in 1883. His most notable pictures are 'Death and the Young Man' (1865); 'Orpheus' (1867) in the Luxembourg; 'Prometheus' (1869); 'Hesiod and the Muses' and 'The Apparition,' the last two in the Luxembourg also. Consult Ary Renan, 'Moreau' (Paris 1900); Flat, 'Le Musée Gustave Moreau' (ib. 1905); Muther, 'History of Modern Painting' (London 1896).

MOREAU, Hégésippe, French poet: b. Paris, 9 April 1810; d. there, 20 Dec. 1838. Of illegitimate descent, losing both parents early, he died young, in poverty and need, in a hospital. He set up type for a book-printer, first in Provins, then at Paris, but found no favor or success in his writings. Tenderness and nobility of character appear in his earlier poems with excellent effect but his more mature works show the ills of fashion and the world's sorrows. His finest poems are the elegies, 'La Voulzie,' etc. Among his novels are 'La Fermière,' 'Contes de ma sœur' and the shy prose novelles, 'Le gui de chêne,' etc. His works are published under the title 'Myosotis' (1838) and his correspondence in 'Œuvres complètes' (1890–91). Consult Moret, J., 'Hégésippe Moreau' (Provins 1871).

MOREAU, Jean Victor, French general: b. Morlaix Finistère, 11 Aug. 1763; d. Laun, Bohemia, 2 Sept. 1813. His father was a lawyer and the son, apparently against his will, studied law and held a post in the justiciary at Rennes. But at the beginning of the Revolution he entered politics, formed a company of the National Guard and in 1791 was elected lieutenant-colonel of a volunteer battalion which joined Dumouriez in the field. He rose rapidly, replaced Pichegru in 1795 as commander of the Army of the North, and in 1796 was put at the head of the Army of the Rhine and the Moselle. His retreat before a superior force after Jourdin's defeat at Würsburg, and his swift movement to the attack again before the truce of Leoben proved him a masterly strategist. Momentarily retired for failure to reveal Pichegru's Royalist plot, he was recalled in 1799; served under Scherer in Italy and largely recouped his superior officer's losses; succeeded Joubert after that general's death; was Bonaparte's confidant in the *coup d'état* of 18th Brumaire; passed the Danube and the Rhine; defeated the Austrians in a series of brilliant engagements culminating in Hohenlinden (1800); and then with the backing of the Royalists attempted to oust Bonaparte. He was found guilty of plotting against Napoleon and was exiled from France for two years, which he spent on a farm in Pennsylvania. Although Republican in his sympathies, in his last campaign he took arms with the Allies, served against France in 1813 and was killed at the battle of Dresden. Consult Jochmus, 'General Moreau' (Berlin 1814); Ary Renan, 'Moreau' (Paris 1900).

MOREAU RIVER. One of the larger branches of the Missouri River draining a wide area in northeastern South Dakota. Its length is about 180 miles. The name is a French one, signifying a dark horse or nosebags. On some maps the name Owl River is improperly given to this stream.

MORECAMBE, mōr′kăm, England, a Lancashire seaside resort on Morecambe Bay, four miles by rail northwest of Lancaster. Its principal features are the promenade pier, three miles long, observation tower, winter garden, etc., and the fine beach of Morecambe Bay, this inlet of the Irish Sea being about 18 miles long and 10 miles broad. Pop. 12,131.

MOREEN. See MOIRE.

MOREHEAD, John Henry, American public official: b. Lucas County, Iowa, 3 Dec. 1861. He was educated in the public schools, removed to Nebraska in 1883 and taught school for some time. Later he engaged in mercantile affairs at Barada, Neb., and in 1896–99 served as county treasurer of Richardson County. In 1900 he was mayor of Falls City and in 1910 was elected member of the Nebraska senate. He was president pro tempore of the senate and lieutenant-governor in 1910–11 and served as governor of Nebraska for the terms 1913–15 and 1915–17.

MOREL. See Fungi.

MORELAND, William Hall, American Protestant Episcopal bishop: b. Charleston, S. C., 9 April 1861. He was graduated from the University of the South in 1881 and was assistant rector at Christ Church, Hartford, Conn., in 1884–85. In 1885–93 he was rector at the church of the Good Shepherd, Nashua, N. H., and in 1893–99 rector of Saint Luke's, San Francisco. He was consecrated bishop of Sacramento in 1899. He has published ‹What is Christianity?› (1887); ‹The Church or the Churches: Which?› (1894), etc.

MORELIA, Mexico, capital of the state of Michoacan, situated on the line of the National Railway, 234 miles west from the city of Mexico, elevation 6,314 feet above the sea, distant by straight line from the nearest point on the Pacific Ocean about 140 miles. The city was founded in 1541 and known as Valladolid until 1828, when it was given the name of Morelia in honor of Morelos (q.v.), patriot and soldier, who was a native of the city, to whom the most notable monument in the city is dedicated. Morelia is set on a rocky eminence rising from the Guayangareo Valley, which is almost surrounded by mountains, and in climatic conditions favorable to the successful cultivation of nearly all grains, fruits and vegetables. Patzcuaro Lake, the most beautiful body of water in the republic, is only 39 miles to the southwestward. The College of Saint Nicholas was founded three centuries ago; the School of Medicine (in the General Hospital) and the Charity Hospital for Women, are among its institutions. There are several well-equipped libraries, the State Library having a remarkable collection of rare books. The great cathedral, begun in 1640 and completed in 1741, is a very imposing edifice. A stone aqueduct of exceeding beauty supplies water for domestic purposes. Cottons and woolens and sugar are among its industries, and *guayabate,* a high-class confection. There are extensive barracks. The streets are well paved, with electric lighting and a municipal tramway system. Pop. 40,042.

MORELL, George Webb, American soldier: b. Cooperstown, N. Y., 8 Jan. 1815; d. Scarborough, N. Y., 12 Feb. 1883. He was graduated at the West Point Military Academy (1835) but resigned (1837) to become civil engineer. He worked three years in Michigan and southern coast States on railroad construction, settling (1840) in New York to study law. He was admitted to the bar (1854) and began practice but was made commissioner of the United States Circuit Court for the southern district of New York. When civil war broke out he was inspector-general on the staff of Major-General Sanford, with the first division New York State militia, and accompanied it to Washington. He was colonel on General Patterson's staff during the Shenandoah campaign and was promoted to brigadier-general, then major-general, commanding the 2d brigade, 2d division, 5th Army corps, to be given next command of a division. He was in command of the supports of the celebrated battery of 100 guns at Malvern Hill, and was engaged at Hanover Court House, Mechanicsville and Gaines's Mills. He contracted germs of disease during the Chickahominy campaign that later proved fatal. He lived on his farm at Tarrytown, N. Y., after being mustered out of the service and was senior warden for many years at Trinity Episcopal parish church, Tarrytown.

MORELL, John Daniel, English philosopher and inspector of schools: b. Little Baddow, Essex, 1816; d. 1891. He studied at Glasgow, taking (1841) the degree of M.A., when he went to Bonn to study theology and philosophy. He was made Congregational minister at Gasport (1842–45), becoming inspector of schools (1848–76) through Lord Lansdowne. He wrote numerous works dealing with English grammar and spelling, as well as his better known ‹Historical and Critical View of the Speculative Philosophy of Europe in the Nineteenth Century› (1846), and his ‹Philosophy of Religion› (1849). Other works are ‹On the Philosophical Tendencies of the Age› (1848); Philosophical Fragments› (1878). Consult Theobald, R. M., ‹Memorials of J. D. Morell› (London 1891).

MORELLA, mō-rā'lya, Spain, town in the province Castellon de la Plana in the mountain district Maestrasgo. It has a 14th century Gothic church, and an aqueduct, a powerful castle and is surrounded by walls with towers. Its industries consist of cloth and cotton fabric factories, dyeing establishment, etc. This is the location of the old Roman Castra Aelia, and it played a prominent rôle during the Carlist wars. In 1839 it was stormed by Cabrera, who received the title Count of Marella. In 1910 it had a population of 6,722.

MORELLI, mō-rĕl'lē, **Domenico,** Italian historical painter: b. Naples, 1826; d. there, 13 Aug. 1901. His true name was Soliero. He studied at Rome under Camillo Guerra, advancing his talent under the influence of Filippo Palizzis, studying nature. He ripened thus into a historical and genre painter of the most successful form, especially through his attractive religious pictures. His chief early works were ‹The Sicilian Vesper,› ‹Count Lara,› ‹The Refugees from Aquileja,› etc. In 1867 he turned to biblical work with his ‹Christ Walking on the Sea,› a grand work; ‹The Descent from the Cross,› ‹Christ in the Desert,› etc. He painted the ‹Ascension of the Virgin› for the royal palace at Naples. He created several ‹Temptations of Saint Antony.› Among other work, the fruits of his journey in the Orient were ‹A Street in Constantinople,› ‹The Road to the Bath,› ‹The Prayer in the Wilderness› and ‹Mohammed before the Battle.› He was made senator of the kingdom of Italy and became director of the Institute of Fine Arts and the Museum of Applied Arts at

Naples, where he used his best influence to advance the decorative arts at the latter institution's classes. Consult Willard, ‹Sketch of the Life and Works of Domenico Morelli› (Boston 1895).

MORELLI, Giovanni, Italian art critic and statesman: b. Verona, 25 Feb. 1816; d. Milan, 28 Feb. 1891. He was educated at Bergamo, then Aarau (Switzerland), but turned his studies to natural science at Munich, becoming interested at the same time in art through Genelli, the painter. After a short stay at Erlangen and a visit to Berlin, where he made the acquaintance of Waagen, the art critic, he joined (1838) Agassiz in investigating the Swiss glaciers. In Paris and Siena and through numerous journeys he gained increasing culture and made acquaintance with Manzoni, Gino Capponi and other prominent Italians. In 1848 he took to politics for a short while, never returning to that field till (1859) he was made commander of the National Guard at Magenta. In 1860–70 he was elected deputy for Bergamo, and (1873) became senator of the kingdom of Italy. His knowledge in art criticism gained during his travels he published in treatises in *Zeitschrift für bildende Kunst* (1874–76). His work ‹Die Werke italienischer Meister in den galerien von München, Dresden und Berlin› (Leipzig 1880), contains his criticism, empiric principles being their base, and show unexcelled connoiseurship. As sequels to this clever work amplifications are contained in the later published ‹Kunstkritischen Studien über italienische Malerei›: Vol. I, ‹Die Galerien Borghese and Doria Pamfili in Rom› (Leipzig 1890), Vol. II, ‹Die Gaulerien zu München und Dresden› (ib. 1891) and Vol. III, ‹Die Galerie zu Berlin› (ib. 1893). Italian translations of these were published (Milan 1897). His ‹Kunstkritische Studien› has been translated by Ffoulkes into English under the title of ‹Italian Painters; critical studies of their works› (1892). In 1895 a monument was erected at Milan to the memory of this genius of keen critical art research.

MORELLY, R., French publicist of the 18th century: b. Vitry-le-François. Beyond the place of his birth and the fact that he became an abbé there, nothing whatever is known of his life. His works, however, are known and important; they are philosophical and socialistic, and consist chiefly of ‹Le prince; les délices du cœur, au traité des qualités d'un grand roi, etc.› (2 vols., Amsterdam 1751), a description of a prince who made his people happy by carrying into action philosophical ideas; ‹Naufrage des îles flottantes, ou la Basilide du célèbre Bilpai› (1753), an allegorical communistic novel which depicts a people ruled by natural laws instead of political. His third work was ‹Code de la Nature› (Amsterdam 1755; Paris 1841), erroneously attributed to Diderot, which sketches a perfect communistic organization and is said to have had considerable influence in the formation of the socialistic propaganda of the French Revolution.

MORELOS Y PAVON, José Maria, hō-sā' mä-rē'ä mō-rä'lōs ē pä-vōn', Mexican patriot: b. near Apatzingan, Michoacan, 30 Sept. 1765; d. near City of Mexico, 22 Dec. 1815. He worked for many years as a muleteer; at 32 entered the college of Valladolid; was ordained to the priesthood three years afterward; and from 1801 to 1810 was in charge of the parishes of Caracuaro and Nucupetaro. In 1810 he joined the standard of rebellion raised by Miguel Hidalgo, who had been rector of the college of Valladolid during Morelos' student days, and after Hidalgo's death kept the cause alive in the north by his own vigorous movements in the south. His few followers soon became an army, and having defeated several Spanish armies he advanced upon the City of Mexico, defeated Porlier 22 Jan. 1812, successfully held Cuautla for 62 days against the famous siege by the viceroy, finally making a skilful withdrawal of his forces, and captured Oaxaca (October 1812) and Acapulco (August 8113). He was made captain-general in November 1813 by the Congress convened at Chilipancingo, and the declaration of Mexican independence soon followed. He attempted to capture Valladolid, was defeated by Iturbide, and taken prisoner was shot as a traitor at San Cristobal Ecatepec. His remains lie in the cathedral of Mexico City.

MORELOS, Mexico, an interior state south of the Federal District and the state of Mexico. Capital, Cuernavaca (q.v). Area, 2,773 square miles; pop. about 183,700. It was named in honor of Gen. José Morelos y Pavon.

MORENO, Afredo Baquorizo, äl-frā'dō bä-kwō-rē'sō mō-rā'nō, Ecuadorian diplomatist and novelist: b. Guayaquil, Ecuador, 29 Sept. 1859. He was graduated in law from the University of Quito and began the practice of his profession in 1884. From 1897 to 1901 he was a member of the Superior Court of Guayaquil, was Minister of Foreign Relations, 1901–02, was elected Vice-President of Ecuador in January 1903, and is now Minister from Ecuador to the United States. He is author of ‹Poetas› (1882); and the novels ‹Titania› (1892); ‹El Senor Peneo› (1892); ‹Una Sonata en Prosa› (1894); ‹Evangelina› (1895); ‹Luz› (1901).

MORESNET, môr'nā, a small neutral territory on the Belgo-Prussian border about five miles southwest of Aix-la-Chapelle, traversed by the Belgian Lüttich-Bleiberg on the west and the Prussian Herbesthal-Aachen railways. The only village is Neutral-Moresnet (or Kelmis) with the important calamine (zinc-silicate) mines and 3,400 inhabitants. The territory was under the protectorate of the signatories of the Vienna Congress (1815) and the citizens had choice of military service with either the Belgian or Prussian army. Many of the inhabitants were French and Dutch, as well as Flemish and German. Under the terms of the Peace Treaty, promulgated 7 May 1919, Belgium was awarded full sovereignty over the contested territory of Moresnet and over part of Prussian Moresnet.

MORETO Y CABAÑA, mō'rā'tō ē kă-bă'-nyă, **Augustin,** Spanish dramatist: b. Madrid, 9 April 1618; d. Toledo, 28 Oct. 1669. Returning home from the University of Alcala, where he had just been graduated in law, he began writing successfully for the stage (1640). In Madrid he soon found a friend and patron in Calderón. He was very prolific, turning out drama after drama until he finally passed the 100 mark before he had reached middle age.

His popularity was immense and he was rated as the equal, if not the superior, of Lope de Vega, by his admirers, among whom were the best critics of the age. Posterity, however, while recognizing the genius of Moreto and his valuable contributions to the Spanish drama, has not sustained this high verdict of his contemporaries. One reason is that Moreto was not original in the sense that Lope de Vega was. His dramas or «Comedias de capa y espada,» while clever in themselves and instinct with the dramatic spirit, have more than an echo of Vega and Calderón, from whom he frequently borrowed and sometimes improved upon, as in ‘El desdén con el desdén,’ which is generally considered to be his masterpiece. In addition to «dramas of intrigue» he also produced historical dramas and wrote considerable lyrical poetry and autos sacrementales. Moreto's incursion into the field of historical drama was probably occasioned by the decree of the Royal Council and Chamber of Castile which, in 1644, educed the numbers of dramas and comedies licensed and ordered that, in the future, the dramatists should turn their attention to historical drama and plays based on the lives of the saints. He found a new field in recasting old dramas, comedies and other plays and making them conform to the requirements of the censor, who was, in reality, controlled by the Church authorities who had dictated the new move for restricting the activities of the drama and the stage. Like Shakespeare, Moreto put so much of himself into this work of reconstruction that many of the new-made dramas were more deservedly his than the work of their first creators. He excelled in painting certain human passions and feelings, among them all the shades of love, including undying passion, disdain, the suffering of unrequited love, jealousy, friendship, faithfulness, unfaithfulness, intrigue in love and in the ordinary affairs of life. In this field he surpassed his predecessor and master, Lope de Vega, and led the way for true and delightful character painting in which the Spanish drama and novel have since shown such power and realism combined with idealism. Moreto painted people of more refined feelings, sentiments and position in life than did Lope de Vega, probably because he was better acquainted with upper class society than was the older dramatist. The complicated complexion of Spanish court life with its intrigues, ambitions, plots and insincerity is well pictured in the dramas of Moreto who swept into his dramatic net every character and condition that he met in his march through life. While he lacks invention and made use, without conscience, of his predecessors and followed the style of drama made popular by Lope de Vega, he gave the Spanish drama characterization and artistic development that it had not previously possessed. He rejuvenated old plays and scenes, breathing into them the breath of life, and he polished his work as no Spanish dramatist had done before his day. He thus pointed the way to the successes that have since his time, been achieved by dramatists and novelists in Spain. Spanish literature, therefore, owes him much. What he lacked in originality of invention be made up in his knowledge of the stage and in his ability to reconstruct the scenes and thoughts of others. His plots move along with rapidity, satisfactory development and wonderful management of dialogue which is ever fluid and graceful. He surpasses his contemporaries in the number and variety of characters which he handles with great skill in his realistic pictures of the extravagances, customs and vices of the life of his day; so that he has made himself the greatest of the Spanish writers of character drama. In this field he shows his deep and wide knowledge of the world and his power to analyze characters and motives, passions and prejudices. Yet, on the whole, his plays are in better taste and superior in morality to those of any of his contemporaries. Comparatively early Moreto entered a convent, embracing monastic life. From there he sent out numerous plays that became the delight of Madrid and other Spanish theatrical audiences for 10 years or more. Among his more notable plays are ‘De fuera vendrá quien de casa nos echara,’ ‘Trampa adelante,’ ‘Los Jueces de Castilla,’ ‘San Franco de sena,’ ‘La fuerza del natural,’ ‘El lindo don Diego,’ ‘El parecido,’ ‘Santa Rosa del Perú,’ ‘El desdén con el desdén,’ ‘Rico hombre de Alcalá’ and many autos sacrementales.

Bibliography.— Carrara, E., ‘Studio sul teatro ispano-veneto di Carlo-Gozzi’ (Caghari 1910); Clarke, H. B., ‘Spanish Literature’ (London 1909); Fernandez-Guerra y Orbe, Luis, ‘Augustín Moreto y Cabaña’ (Biblioteca de autores españoles, Vol. XXXIX); also in Vol. LVIII of the same work for ‘Autos Sacrementales’ of Moreto; Fitzmaurice-Kelly, ‘A History of Spanish Literature’ (New York 1898); Giyas, E., ‘Studien og Essays’ (Copenhagen 1898); Mariscal de Gante, Jaime, ‘Los autos sacramentales desde sus origines hasta mediados del siglo XVIII’ (Madrid 1911); Pérez Pastór, Cristóbal, ‘Bibliographiá Madrilena’ (part 3, Madrid 1907); Ticknor, G., ‘History of Spanish Literature’ (New York 1854).

MORETON (mōr'tŏn) **BAY,** Australia, on the east coast of Queensland, formed inside the islands of Moreton and Stradbroke, is 40 miles long by 17 broad; its south half is dotted with islands and sandbanks. It receives six considerable rivers, including the Brisbane, with the important city of Brisbane at its outlet. The entrance at the north end is practicable at all times for vessels of the largest size; the entrance between Moreton and Stradbroke islands is narrow and less safe. Moreton Bay was discovered by Captain Cook in 1770, and explored by Flinders in 1799.

MORETTO DA BRESCIA, mō-rĕt'tō dä brā'chē-ä (his proper name was ALESSANDRO BONVICINO), Italian painter: b. Brescia, 1498; d. there, 1554. He took Titian as his model, imitating also Palma Vecchio and Romanino, whose styles he developed on independent lines of his own. He was already famous as an artist at 18, and is reckoned a master of pictorial expression, uniting in his coloring tenderness and freshness of flesh tones with a brilliant power of chiaroscuro. His pictures are particularly noted for their bright background, from which his figures stand out with life-like clearness. His frescoes were less successful. His numerous religious paintings are full of devotional feeling. Most of these are at his native town of Brescia. In Saint Clement's Church in that city is a vast altar-piece of his containing a Madonna and Child surrounded by singing angels and the Saints Clement, Dominick, Florian, Catharine and the Magdalen. He painted an 'Assumption' in the church of San Mazaro. His masterpiece, 'The Virgin Appearing to a Shepherd,' is in the church at Paitone, province of Brescia. There are some fine paintings of his in the galleries at Berlin and Frankfort, and in the Brera at Milan: and examples are to be found also in the public galleries of Vienna, Petrograd, London and Paris. The portraits by this master are equally excellent in conception and power of coloring. Consult the volume in the 'Painters Series' (New York 1910), and 'Masters of Art' (Vol. IX, Boston 1908).

MOREY, mō'rĭ, **Samuel**, American inventor: b. Hebron, Conn., 23 Oct. 1762; d. Fairlee, Vt., 17 April 1843. He early evinced a talent for mechanics and engineering, and at the time of the opening of the Connecticut River to navigation designed and built the locks at Bellows Falls. On his large estates he built chutes with which to bring his pine logs to the mills years before Napoleon's accomplishment of the feat in the Alps. When but 18 he began his experiments with steam, and in 1790 had conceived the idea of propelling boats by means of an improved steam-engine. In 1793 he succeeded in building a boat which attained a speed of four miles an hour, which later he improved and exhibited in New York with a speed of five miles an hour. Morey was often in consultation with Professor Silliman of Yale College as to the value of his inventions; and when Chancellor Robert R. Livingston offered him $7,000 for the patent allowing him to run the boat from North River to Amboy, Morey declined. He continued his experiments, encouraged by an offer of $100,000 for an eight-hour steamboat which Livingston was said to have made, and several patents were issued to Morey which showed that he considered the object almost within his reach. In 1797 he exhibited a greatly improved boat at Philadelphia and became famous throughout the Middle and New England States. His object seemed practically achieved and arrangements were made for the operation of the steamboats, when misfortune overtook the capitalists who were to promote the enterprise and it failed of operation. Morey is believed by many authorities to have been the real inventor of the steamboat, as Robert Fulton visited him before the exhibition of his own invention.

MOREY, William Carey, American professor: b. Attlemoro, Mass., 23 May 1843. He left his studies at the University of Rochester to enter the army as volunteer during the Civil War, becoming brevet major and lieutenant-general. Returning to college he graduated (1868) at the University of Rochester and entered (1869) the Rochester Theological Seminary. He was professor of history and English literature at Kalamazoo College (1870–72), becoming professor of Latin and history (1872–83) and of history and political science (1883–) at the University of Rochester. He had the degree D.C.L. conferred on him by Denison (1903) and Rochester (1908). He wrote 'Outlines of Roman Law' (1884); 'Outlines of Roman History' (1900); 'Government of New York' (1902); 'Outlines of Greek History' (1903); 'The study of Roman Law in Liberal Education' (1911); 'Outlines of Ancient History' (1906).

MOREY LETTER, The, in American political history the forgery of a letter during the Garfield-Hancock campaign of 1880. The letter which favored Chinese immigration purported to have been written by General Garfield and to be addressed to H. L. Morey, Lynn, Mass., and was made public in the New York *Truth*, 20 Oct. 1880, and a facsimile published in the same paper three days later. James A. Garfield, Republican candidate for President, denounced the letter as a forgery, but Democrats made liberal use of the document and many votes, it is said, were lost to the Republicans through the publication of the letter. Consult Davenport, 'History of the Morey Letter' (New York 1884).

MORGAGNI, Giovanni Battista, jō-vän'nē bät-tēs'tä mŏr-gän'yē, Italian anatomist: b. Forli, 25 Feb. 1682; d. Padua, 6 Dec. 1771. After taking his degree of M.D. at Bologna, he went to Venice and ultimately to Padua, where in 1712 he became professor of the theory of physics; and in 1715, as successor of Molinetti, was appointed to the principal anatomical chair in the same institution, which he continued to occupy till his death. He was the first to show the importance of anatomy as being the basis of all other medical studies, and is regarded as the founder of pathological anatomy. He established a great reputation, students from all parts of Europe flocking to Padua. His most celebrated works are 'Adversaria Anatomica' (1706–19), afterward enlarged and published under the title of 'Adversaria Omnia' (6 vols., 1741); and particularly his 'De Sedibus et Causis Morborum per Anatomen Indagatis' (1761; 6 vols., Leipzig 1827), which has been translated into various European languages.

MORGAN, Charles Hill, American mechanical engineer: b. Rochester, N. Y., 8 Jan. 1831; d. 1911. He was educated at public school and Lancaster Academy, entering his uncle's machine shop at Clinton, Mass., in his 18th year, studying in spare time mechanics and drawing. From 1855–60 he was draughtsman for Erastus B. Bigelow. He designed and constructed one of the first automatic paper bag machines and associated himself with his brother in paper and paper bag making in Philadelphia. He became superintendent (1864) of Washburn and Moen Wire Works, Worcester, Mass., where he became very prominent as mechanical engineer, bringing about great improvements in the wire drawing processes, etc. In 1887 he became consulting engineer for the American Wire Company, Cleveland, Ohio, and opened up an office in Worcester. In 1891 he established the Morgan Construction Company, of Worcester, Mass. for making rolling mill appliances, etc., and at the same time was president of Worcester Polytechnic Institute. In 1881 the Morgan Spring Company was organized at that city of which he became president. He was president of the American Society of Mechanical Engineers 1899–1900.

MORGAN, Conwy Lloyd, British zoologist: b. London, 6 Feb. 1852. He was educated at the Royal Grammar School, Guildford, and Royal College of Science. From 1878–83 he was lecturer in English and physical science at the Diocesan College, Rondesbosch, Capetown, then (1884) professor of zoology and geology at University College, Bristol, becoming principal (1887–1909). He was appointed vice-chancellor of the University of Bristol, but resigned after three months. He has written 'Animal biology' (1887); 'Animal Life and Intelligence' (1890); 'Animal Sketches' (1891); 'Introduction to Comparative Psychology' (1895); 'Instinct and Experience' (1912); 'Spencer's Philosophy of Science' (1913).

MORGAN, Daniel, American soldier: b. Hunterdon County, N. J., 1736; d. Winchester, Va., 6 July 1802. His early life was passed in obscurity and in 1753 he removed to Virginia where in 1755 he served under Braddock as a teamster. He was afterward engaged in Indian warfare and served in Pontiac's War and in Lord Dunmore's War. In 1775 he entered the army of the colonists and commanded a company of riflemen under Washington. He accompanied Arnold at Quebec in 1775 and rendered gallant service there but was captured by the British and not exchanged until nearly a year afterward. He was then given command of a Virginia regiment with the rank of colonel, and in the campaign against Burgoyne took a prominent part; but his services not being recognized by Congress, he resigned. In 1780 he returned to the service as brigadier-general under Gates, and under General Greene who succeeded Gates. Morgan won a brilliant victory over Tarleton at Cowpens, which was recognized by a gold medal from Congress. His subsequent movements were of serious annoyance to Cornwallis, but in 1781 he resigned from the army owing to ill health. In 1794 he returned to it as major-general and helped to crush the Whisky Insurrection, and from 1795–99 was a member of Congress. Consult Graham, 'Life of General Daniel Morgan of the Virginia Line' (1856); McConkey, 'The Hero of Cowpens' (2d ed., 1885).

MORGAN, Edwin Dennison, American politician: b. Washington, Mass., 8 Feb. 1811; d. New York, 14 Feb. 1883. He was educated in the public schools, at 17 entered the store of his uncle in Hartford, Conn., and three years later was made a partner in the business. In 1836 he removed to New York and engaged in the grocery business. During the cholera visitation of 1849 he rendered devoted service. Elected to the State senate in 1850, he continued in that office until 1858, when he was elected governor of the State and served until 1862, his administration during those trying times being marked by great sagacity and patriotism. About 223,000 troops were raised for the Federals; New York's firm attitude during the war being in large measure due to Governor Morgan's influence. In 1862 he was elected to the United States Senate; in 1865 he declined the secretaryship of the treasury offered him by President Lincoln, and again refused it under Arthur. He served in the Senate until 1869, and though still taking an active interest in politics held no further political office excepting that of chairman of the Republican committee which conducted the presidential campaign of General Grant in 1872. He was connected with numerous great financial enterprises during the last years of his life and was a generous benefactor to education, notably to the New York Theological Seminary and Williams College.

MORGAN, Edwin Vernon, American diplomatist: b. Aurora, N. Y., 22 Feb. 1865. He graduated (1890) at Harvard University and studied (1891–92, 1894–95) at the Berlin University. He was appointed assistant in history (1892–94) at Harvard and instructor in history (1895–98) at Adelbert College, Cleveland. In 1899 he was appointed secretary to the Samoan Commission, and (1900) secretary of legation at Seoul, Korea. He served as second secretary of the embassy, Saint Petersburg (1901) and as consul at Dalny, Manchuria (1904), Minister Plenipotentiary to Korea (1905), filling the same diplomatic position at Cuba (1905–10), then Uruguay, Paraguay (1910–11), and Portugal (1911–12). He was made Ambassador Extraordinary and Plenipotentiary at Brazil 1912.

MORGAN, George Campbell, British Congregational preacher: b. Tetbury, Gloucestershire, 9 Dec. 1863. He was educated at the Cheltenham Douglas School, became master in the Jewish Collegiate School, Birmingham (1883–86), then mission preacher (1886–88), to be ordained (1889) to the Congregational ministry. He served as pastor at Stone, Staffordshire (1889–91); Rugely (1891–93); Westminster Road, Birmingham (1893–97); New Court Tollington Park, London (1897–1901). He was extension lecturer (1901–04), then pastor of Westminster Congregational Chapel (1904–17). He wrote 'The Analyzed Bible' (10 vols. 1910); 'Evangelism'; 'The Life of the Christian' (1904); 'God, Humanity and War' (1914). He has been editor of *The Westminster Bible Record* and *The Westminster Pulpit*.

MORGAN, Sir George Osborne, English politician: b. Gothenburg, Sweden, 8 May 1826; d. 1897. He was graduated at Oxford in 1848 and was admitted to the bar in 1853. In 1868 he became a member of the House of Commons and was a staunch supporter of various reform movements, particularly those concerning the English land laws, Welsh disestablishment and education. He was appointed judge-advocate-general in Gladstone's ministry in 1880 and carried through legislation abolishing flogging in the army; and in 1886 was Under-Secretary for the Colonies. He was created a baronet in 1892 and was leader of the Welsh party in the House of Commons until his death. He was the author of a work on 'Chancery Acts and Orders' (1858).

MORGAN, George Washbourne, American organist: b. Gloucester, England, 9 April 1822; d. Tacoma, Wash., 10 July 1892. When he was eight he played the entire service at Saint Nicholas' Church in Gloucester, and at 12 became assistant organist at the cathedral there. He removed in 1853 to New York, where he was organist in several leading churches, and gave recitals in different cities of the United States with marked success. He conducted an annual Lenten service in Chickering Hall, New York, after 1880, and was the author of an Episcopal service, and numerous compositions.

MORGAN, George Washington, American soldier: b. Washington County, Pa., 20 Sept. 1820; d. Old Point Comfort, Va., 26 July 1893. He left college in 1836 to enlist in the Texas army and fought for the independence of that country as lieutenant and then as captain when he resigned and in 1841 entered West Point. In 1843 he left the academy to study law and established a law practice at Mount Vernon, Ohio, in 1845. When the Mexican War broke out he became colonel and served under General Scott with distinction, becoming brevet brigadier-general. He returned to his law practice and in 1856 was sent as United States consul to Marseilles; in 1858 he went from there to Portugal Minister where he remained until 1861. He entered the army immediately upon his return to the United States and as brigadier-general was given a command under General Buell. In 1862 he took command of a division of the Army of Ohio, later was with Sherman at Vicksburg and held the command at the capture of Fort Hindman, Ark. He resigned in 1863 on account of failing health. He was a member of Congress from 1869 to 1873.

MORGAN, Sir Henry John, Welsh buccaneer, lieutenant-governor of Jamaica: b. Llanrhynny, Glamorganshire, about 1635; d. Jamaica, 1688. While a boy he was kidnapped at Bristold and sold at Barbados. Just when he joined the Jamaica buccaneers is uncertain, as there were several Morgans in the marine at Jamaica at the time, but he may have commanded his own ship as early as 1663; a Captain Morgan who sailed from Jamaica in that year taking part in the sack of Vildemos, Truxillo and Granada (1665–66). In 1666 Morgan sailed under Mansfield to capture Curaçao, and was chosen admiral after Mansfield's death at the hands of the Spaniards. In 1668 he captured Puerto Principe in order to get information of Spanish plans for an attack on Jamaica; then took Porto Bello, Panama, after a sharp siege during which the buccaneers planted scaling ladders under the cover of captured priests and nuns, sacked the city and tortured and maltreated its inhabitants; and in the end of the summer again ravaged Cuba. The next year, 1669, saw Morgan's attack on Maracaibo, followed by fresh outrages. The arrival of three Spanish warships did not check Morgan's success, for he set fire to one ship, captured another and forced the Spaniards to beach and burn the third; he killed almost all his prisoners, recovered 15,000 pieces of eight from the sunken ship, got a ransom for the city from the Spanish forces in the fort and by a clever manœuvre made his escape. Returning to Jamaica he was first reproved for exceeding his powers and then made commander-in-chief of the entire naval force of Jamaica, so that in 1671, with a stronger force under him than before, he approached the city of Panama, which he captured after a thrilling battle, in which the Spanish cavalry was broken by riding into a swamp, and further execution was done by a herd of cattle which the Spaniards intended should break the English ranks but which stampeded the Spanish. This attack and the capture of Panama occurred some time later than the signature of peace between England and Spain, and in consequence Morgan was ordered to England for trial in 1672. Nothing serious came of this, however, possibly because Morgan made free use of his wealth in England. In November 1674 he held a commission as lieutenant-governor of Jamaica. He can hardly be called a pirate; his cruel, brutal methods were those of his enemies and England's enemies. The primary source for Morgan's life is Exquemeling, 'Buccaneers of America' (1684), the work of one of Morgan's followers and reprinted in the 'Adventure Series' (London 1891). Professor J. K. Laughton in the 'Dictionary of National Biography' (Vol. XXXIX, 1894), first set straight the chronology of Morgan's life. Popular accounts are Hutcheson, 'Sir Henry Morgan' (1890); Pyle, 'Buccaneers of America' (1891); Stockton, 'Buccaneers and Pirates of Our Coast' (1898); and Brady, 'Sir Henry Morgan,' a romance (1902).

MORGAN, James Appleton, American lawyer and author: b. Portland, Me., 2 Oct. 1850. He was graduated at Racine College, Wisconsin, in 1867, and at the Columbia Law School in 1869, and in 1871 began the practice of law in New York City, becoming professionally associated with railroad interests. In 1885 he founded the Shakespeare Society of New York, of which until 1910 he was president. His view of the First Folio of 1623 is that the plays as therein printed are not monographs almost solely attributable to Shakespeare, but «growths» embodying «improvements,» alterations and expressions by many hands; and the society's publication, the 'Bankside Edition of Shakespeare' (22 vols., 1888–1906), edited by him, contains the earliest players' rendering printed in parallel columns with the First Folio. His writings include 'Macaronic Poetry' (1870); 'The Law of Literature' (1874); 'Legal Maxims' (1877); 'The Shakspearean Myth' (1880); 'Shakespeare in Fact and Criticism' (1884); 'Some Shakespearean Commentators' (1885); 'Digest Shakespeareana' (1887); 'The People and the Railways' (1888); and 'The Society and the Fad' (1890); 'Bankside Restoration Shakespeare' (5 vols., 1905–08).

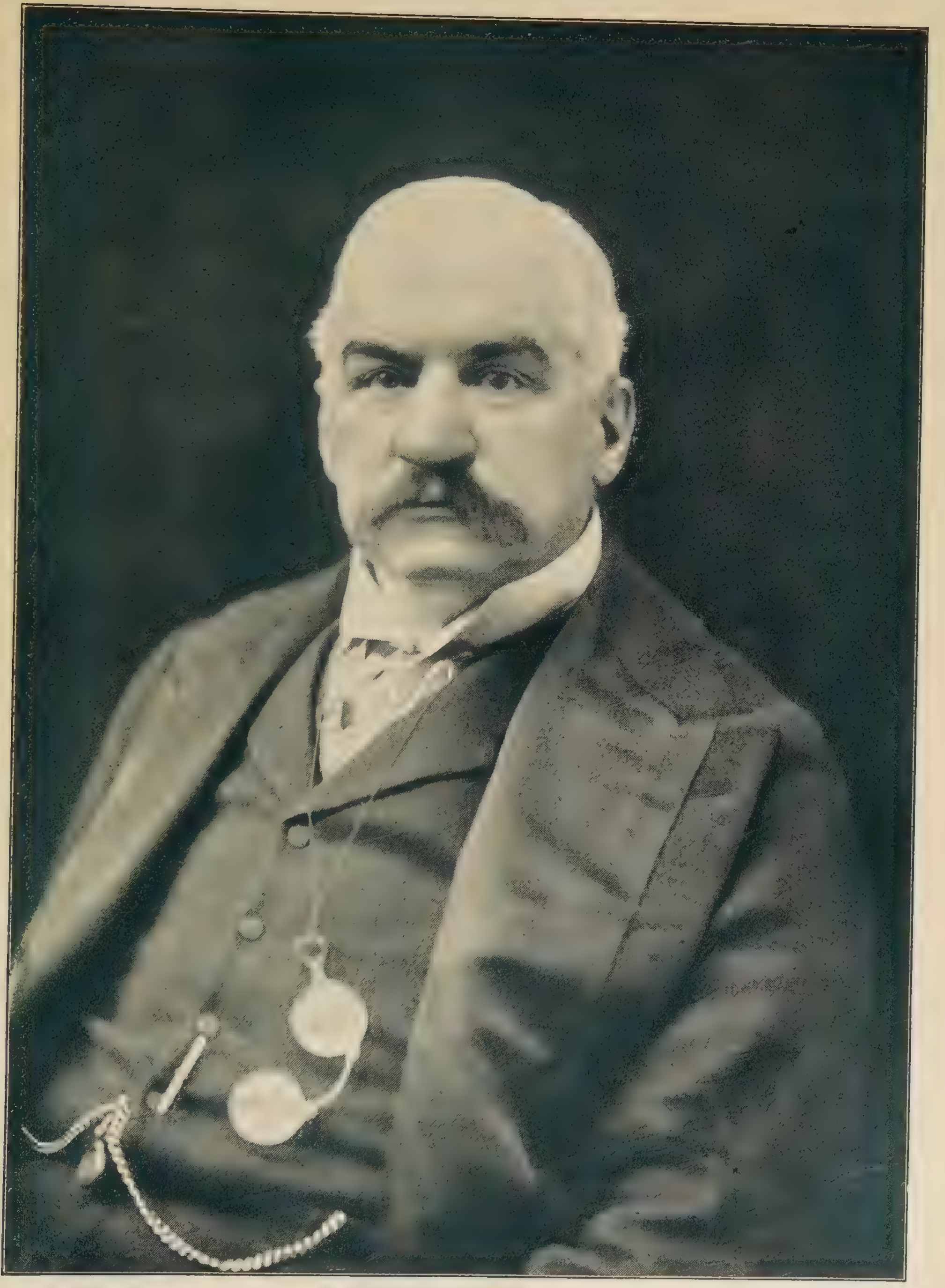
MORGAN, John, American physician: b. Philadelphia, 10 June 1735; d. Philadelphia, 15 Oct. 1789. He was graduated (1751) at the College of Philadelphia (now known as the University of Pennsylvania) and served an apprenticeship in medicine under Dr. John Redman. He entered the provincial army as surgeon and lieutenant, resigning his commission to continue (1760) his medical studies in London and Edinburgh, receiving the degree of M.D. 1763. During a visit to Paris he was made member of the Academy of Surgery for clever anatomical preparation of a kidney. In Italy he was made member of the Society of Belles-Lettres, Rome, and on his return to London was elected Fellow of the Royal Society and licentiate of the Colleges of Physicians of both London and Edinburgh. Returning (1765) to Philadelphia he laid the plan for establishing a medical school in that city, which he had formulated, at the request of the trustees of the College of Philadelphia. The plan adopted, he was elected professor of the theory and practice of medicine, and, three years later, five young men received medical degrees — the first conferred in America. In 1775 he was appointed by Congress director-general and physician-in-chief to the general hospital of the American army, and reorganized the hospitals of the army. But lack of supplies for the sick and wounded made his energetic efforts largely ineffective and complaints to Washington caused Congress (1777) to dismiss him without reason. A committee of that body, however, after an investigation, honorably acquitted him of blame, while Washington wrote him: «No fault could be found with the economy of the hospitals during your directorship.» He wrote ‹A Discourse on the Introduction of Medical Schools in America› (1765), and his dissertation ‹The Reciprocal Advantages of a Perpetual Union between Great Britain and her American Colonies› (1766) won him a gold medal from England.

MORGAN, John Hartman, British publicist and educator: b. 20 March 1876. He was educated at Caterham School, studied at University College of South Wales, Balliol College, Oxford, and University of Berlin. From 1901–03 he was on the literary staff of the *Daily Chronicle,* became editorial writer on the *Manchester Guardian* (1904–05), and London University Extension lecturer as well as at the London School of Economics. He became lecturer in constitutional law at London University College (1907) and was Liberal candidate, in 1910, for Edgbaston (Birmingham), and later in the year for West Edinburgh. Since 1916 he has been staff-captain on the adjutant-general's staff. He has written ‹The House of Lords and the Constitution› (1910); ‹The New Irish Constitution› (1912); ‹The German War Book› (1915); ‹German Atrocities: An Official Investigation› (1916). Many articles from his pen have appeared in the leading periodicals.

MORGAN, John Hunt, Confederate general: b. Huntsville, Ala., 1 June 1826; d. New Greenville, Tenn., 4 Sept. 1864. His boyhood was spent in Lexington, Ky., where he was later a manufacturer of bagging. He served through the Mexican War as lieutenant of cavalry. At the outbreak of the Civil War he, with 200 men of the local militia, made for the Confederate lines, and he was appointed a captain of volunteers. Soon discovering that he could best serve the Confederacy by adopting guerrilla methods of warfare he began the series of raids which so annoyed the Union commander. Moving with great celerity, and accompanied by his own telegraph operator, he kept himself acquainted with the plans of the enemy while he misled them regarding his own position. As the result, bridges which they expected to cross were burned, much-needed supply trains were captured and railroad tracks were destroyed. In 1862 he was rewarded by appointment as major-general. In 1863 he projected an extended raid through Kentucky, Ohio and Indiana, but was captured and, with many companions, imprisoned in the Ohio Penitentiary. Escaping, he again attempted a raid but, while sleeping at a farmhouse near Greenville, Tenn., he was surrounded by National troops under Gen. Alvin C. Gillem, and upon attempting to escape was killed. See MORGAN'S RAID INTO INDIANA AND OHIO.

MORGAN, John Livingston Rutgers, American chemist: b. New Brunswick, N. J., 27 June 1872. He was graduated (1892) at Rutgers College, received Ph.D. diploma at University of Leipzig (1895) and was appointed assistant in chemistry at Stevens Institute (1895–96). He became instructor of quantitative analysis at Brooklyn Polytechnic Institute (1896–97). He served at Columbia University as tutor of chemical physics and chemical philosophy (1897–1901), professor of physical chemistry (1901–05) and as professor since 1905. He has written ‹The Principles of Mathematical Chemistry› from Helms' German work (1897); ‹The Theory of Solution and its results› (1897); ‹Elements of Physical Chemistry› (5th ed., 1914); ‹Physical Chemistry for Electrical Engineers› (2d ed., 1909), besides contributing to the chemical periodicals.

MORGAN, J(ohn) Pierpont, American financier: b. Hartford, Conn., 17 April 1837; d. Rome, Italy, 31 March 1913. He was the son of J. S. Morgan (q.v.). He was educated at the English High School in Boston and at the University of Göttingen, Germany. He began his business career in the banking house of Duncan, Sherman & Co., New York City; in 1860 he became agent and attorney in the United States for George Peabody & Co. of London; in 1864 junior member of the banking firm of Dabney, Morgan & Co., and later member of the firm of Drexel, Morgan & Co., of which his father was also a partner. By the death of the older members of the firm he became the head of the latter house and the firm name was changed to J. P. Morgan & Co. He also controlled the firm of J. S. Morgan & Co. of London and had partnership interest in Drexel & Co. of Philadelphia. For many years his chief interest lay in railroad negotiations and combinations, and he gradually gained control of the New York Central system, the New York, New Haven and Hartford, the Reading, the Erie, the Lehigh Valley, the Southern, the Northern Pacific, the Big Four and the Chesapeake and Ohio. Shortly after this great railroad consolidation was completed (1901), he succeeded in organizing the «United States Steel Company,» uniting the Carnegie Steel Works and other large concerns with a capitalization of $1,100,000,000, and dominating the steel industry of the United States. In the same year he bought up a large English shipping line with the evident design of organizing a trust for the control of transatlantic shipping, but did not succeed in completing the consolidation. He was the head of both the anthracite and the soft coal trusts, and was several times prominent in the settlement of miners' strikes. In 1895 he organized the syndicate which floated the United States bond issue of $62,000,000, for the increase of the gold reserve; and in 1901 secured American subscriptions of $50,000,000 to the British war loan. In 1912 he testified before the Pujo Banking Committee in Washington, appointed by the House of Representatives to investigate the alleged «Money Trust.» Probably no other American capitalist was so well known and so thoroughly



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J. PIERPONT MORGAN

trusted in Europe as Mr. Morgan; particularly was this true as regards England, and a large majority of English investments in American securities were made through his house; everywhere he was recognized, not merely as a man of vast wealth, but also as a man of unusual organizing and constructive ability. He gave largely to many charities and institutions, particularly to hospitals, churches and the Trade School in New York, and to Harvard University. He was an enthusiastic yachtsman, was for two years commodore of the New York Yacht Club and built the yacht *Columbia,* which defeated Sir Thomas Lipton's *Shamrock* in the international yacht races. Mr. Morgan was the greatest art collector of his time, his collections being among the most varied and important ever owned by an individual. The historic and romantic aspects of art appealed more strongly to him than the purely æsthetic. He built a beautiful library adjoining his home, wherein he housed a collection of important manuscripts and rare and handsomely-bound books. The Metropolitan Museum of Art in 1913 exhibited most of his collections. Thirteen galleries were needed to house the many rare specimens of Byzantine and Gothic enamels and ivories, bronzes and marbles of the Renaissance, metal work, crystals, Flemish tapestries, a great collection of miniatures and paintings by artists of the first rank. His collection of porcelains, French furniture and objects of decorative art and the paintings of the celebrated Fragonard room were sold by his son in 1915. Mr. Morgan published elaborate catalogs of nearly all of his collections. Consult the catalogs published by the New York Museum of Art (1914), and for much valuable material on Mr. Morgan's career as financier, art collector and philanthropist, consult the New York *Evening Post* of 31 March 1913.

MORGAN, J(ohn) Pierpont, American financier, son of John Pierpont Morgan (1837–1913): b. Irvington, N. Y., Sept. 1867. In 1889 he was graduated at Harvard University and soon afterward entered the London branch of J. P. Morgan & Co., bankers, remaining until 1901. He became a member of the firm and upon his father's death in 1913 became its head. He inherited the greater portion of his father's vast wealth including his almost priceless art collections. He also succeeded to the directorate of several corporations in which his firm held large financial interests, including that of the New York, New Haven and Hartford Railroad. He resigned from the latter in 1914 when criticism of the financial management of that road became general. Mr. Morgan is a director of the United States Steel Corporation, of the International Mercantile Marine Company, of the Pullman Company, the Northern Pacific Railway, the First Security Company of the City of New York, the Ætna Insurance Company and the New York and Harlem Railroad Company. When the United States negotiated the purchase of existing canal rights in the Panama Zone Mr. Morgan arranged for the payment of $40,000,000 in gold to the French Panama Canal Company. After the outbreak of the European War he made a first loan of $12,000,000 to Russia. In January 1915 the Morgan firm was appointed the commercial agent of the British government in the United States and thereafter conducted the purchase of all munitions and supplies for the Entente in the United States. In the same year the control of the Equitable Life Assurance Society was sold by Mr. Morgan to T. Coleman Du Pont. On 1 July 1915 at Glen Cove, L. I., Mr. Morgan was shot by a fanatic, but escaped with minor injuries. A loan of $50,000,000 was made to the French government by the Morgan firm in April and a few months later the firm organized a syndicate of about 2,200 banks in the United States and floated a loan of $500,000,000 to the Entente Allies. Mr. Morgan is a member of the advisory council of the Federal Reserve Board, member of the New York Exchange, trustee and treasurer of the Church Pension Fund and governor of the Peabody Donation Fund.

MORGAN, John Tyler, American lawyer and politician: b. Athens, Tenn., 20 June 1824; d. Washington, D. C., 11 June 1907. He went to Alabama when nine years old, received his education there, was admitted to the bar in 1845 and commenced practice. He rapidly gained a high reputation as a lawyer and speaker; was presidential elector in 1860, voting for Breckenridge, and in 1861 was a delegate to the Alabama convention which declared for secession. He enlisted in the Confederate army as a private in 1861; in 1862 raised a regiment in his State, of which he was made colonel; and in 1863 was commissioned brigadier-general and commanded a division under General Johnston. After the war he resumed the practice of law at Selma, Ala.; was presidential elector on the Democratic ticket in 1876, and sat in the United States Senate from 1877 until his death. He was long recognized as one of the ablest leaders of the Democrats in the Senate, was a member of the Senate Committee on Foreign Relations and for some years its chairman; in his last term he was chairman of the Committee on Interoceanic Canals and, favoring in that capacity the Nicaragua Canal route instead of the Panama, was removed from his post in November 1903. He was an earnest and able advocate of recognition of Cuban independence, and won popularity in all parts of the country by his eloquent speeches in behalf of Cuba. In 1892 he was a member of the board of arbitration on the Bering Sea Fisheries, and in 1898 was one of the commission appointed to prepare a system of laws and organize the government for the Hawaiian Islands.

MORGAN, Junius Spencer, American financier: b. West Springfield (now Holyoke), Mass., 14 April 1813; d. Monte Carlo, Monaco, 8 April 1890. He entered a dry-goods store when a boy and remained there until he came of age, when he was engaged for 18 months in banking in New York. He returned to the dry-goods business in Hartford, Conn., where he was junior partner in a leading firm and rapidly advanced until he formed a partnership under the name of J. M. Beebe, Morgan & Co., which became one of the largest dry-goods establishments in the United States. In 1854 he became a member of the banking house of George Peabody & Co., in London, which subsequently became J S. Morgan & Co., and was ranked among the world's greatest banking houses. He was a generous benefactor of various public and private institutions, among them being Trinity College, Hartford, and the Hartford Orphan Asylum. He established a public library in Hartford and made valuable donations to the Metropolitan Museum of Art, Yale College, etc.

MORGAN, Lewis Henry, American archæologist and anthropologist: b. Aurora, N. Y., 21 Nov. 1818; d. Rochester, N. Y., 17 Dec. 1881. He was graduated at Union College in 1840, practised law at Rochester in 1844–64 and served in the State assembly (1861) and senate (1868–69). His enduring fame rests on his researches in the history and customs of the American Indians. In his labors he received the aid of the Smithsonian Institution and the United States government. He spent much of his time among the tribes and was regularly admitted into the Senecas. His earliest work, 'The League of the Iroquois' (1851; new ed., 1904), was the first scientific account of the organization and government of an Indian tribe; but even more valuable are his 'Systems of Consanguinity and Affinity of the Human Family' (1869) and his treatise on 'Ancient Society' (1877), each based on the same material, the former being a collection of facts, the latter a philosophical treatise. He also published 'The American Beaver' (1868) and 'Houses and House-life of the American Aborigines' (1881). In 1875 he was elected to the National Academy of Sciences and 1879 was president of the American Association for the Advancement of Science. He bequeathed $80,000 to found a woman's college at the University of Rochester.

MORGAN, Matthew Somerville, American artist: b. London, 27 April 1839; d. New York, 2 June 1890. He studied scene painting, but soon abandoned it to become correspondent and illustrator for the London *News*, afterward studying in Paris, Italy and Spain, and in 1858 penetrated the interior of Africa on a sketching tour. Returning to London he became joint editor and proprietor of the *Tomahawk*, and his cartoons, which audaciously attacked the aristocracy and royalty, brought him into disfavor. He assisted in the establishment of the London *Fun*, and in 1870 removed to the United States, where he was engaged with Frank Leslie. He managed several theatres in New York, managed the Strobridge-Lithograph Company of Cincinnati in 1878–85, and founded in that city the Matt Morgan Pottery Company and the Art Students' League.

MORGAN, Morris Hickey, American classical scholar: b. Providence, R. I., 8 Feb. 1859; d. 1910. He was graduated (1881) at Harvard, receiving (1887) the degree Ph.D. He held the chair of classical philosophy at Harvard. He wrote 'De Ignis Eliciendi Modis apud Antiquos' (1890); 'Dictionary to Xenophon's Anabasis' (1892); 'A School Latin Grammar' (1899); 'The Minor Works of Tacitus' (1904); 'The Language of Vitruvius' (1906). Among his published translations are 'Xenophon's Art of Horsemanship' (1893); 'Bibliography of Persius' (1893); 'The Phormio of Terence' (1895); 'Eight Orations of Lysias' (1895). Numerous essays and reviews from his pen have been published in the contemporary philological periodicals.

MORGAN, Sydney Owenson, Lady, Irish novelist: b. Dublin, Ireland, about 1783; d. London, 14 April 1859. Her father was an actor on the Dublin stage, of the name of Mac Owen, afterward changed to Owenson. She was a governess for a time. Her first literary effort was a volume of poems (1801), followed by a collection of Irish songs and two novels, 'Saint Clair' and the 'Novice of Saint Dominick' (1804). In 1806 appeared her 'Wild Irish Girl,' a novel which, avowedly nationalist in sympathy and containing good descriptive passages, established her reputation, became immediately popular and secured for her a high position in fashionable and literary life. She had by this time removed from Dublin to London, and in 1812 was married to Sir Charles Morgan, an eminent physician. She also contributed English words to be set to Irish airs. In 1837 she received a civil list pension of £300 a year, the first woman author to be so rewarded. Her style was inflated and gushing; her vanity was inordinate; but she drew many vivid characterizations of Irish character. Among her other works are novels 'O'Donnell'; 'Florence McCarthy'; and 'The O'Briens and The O'Flahertys'; the 'Life and Times of Salvator Rosa'; 'Woman and her Master'; and 'Passages from my Autobiography.' Consult Fitzpatrick, W. J., 'Lady Morgan' (London 1860).

MORGAN, Tali Esen, American choral conductor: b. Llangynwyd, Wales, 28 Oct. 1858. He studied music and came (1876) to Scranton, Pa., and was publisher of the *Cambro-American*, Scranton, in 1879, also editing *The People*, the State prohibition organ for six years. He was associated (1887) with Walter Damrosch on musical work and later with Anton Seidl; conducting the Ocean Grove (N. J.) Festivals since 1888, becoming manager and conductor of the Ocean Grove Summer Music Festivals from 1898. He was next conductor of the New York Festival Chorus. He is editor and publisher of *The American Musical Times* and president of the International Correspondence School of Music, Asbury Park, N. J.

MORGAN, Thomas Hunt, American zoologist: b. Lexington, Ky., 25 Sept. 1866. He was graduated (1886) at the State College of Kentucky, took the degree Ph.D. (1890) at Johns Hopkins and became professor of biology at Bryn Mawr (1891–1904). In the latter year he was appointed professor of experimental zoology at Columbia University. He was given the degree LL.D. by Johns Hopkins in 1917. He has written 'The Development of the Frog's Egg' (1897); 'Regeneration' (1901); 'Evolution and Adaptation' (1903); 'Experimental Zoology' (1907); 'Heredity and Sex' (1913); 'Critique of the Theory of Evolution' (1916). Many monographs and papers of his have been published on biology and embryology, etc.

MORGAN, William, American Freemason, whose death was the immediate cause of the formation of the Anti-Masonic party: b. Culpeper County, Va., about 1775; d. possibly near Niagara in 1826. He fought in the defense of New Orleans in 1815; removed to York, Canada, in 1821, where he became a brewer, and whence soon after he moved to Batavia, N. Y.; and in August 1826 disappeared soon after a rumor had been spread that he was to reveal in a book the secrets of the Masonic Order. He was supposed to have been abducted by fellow-Masons and drowned in Lake Ontario, but his death was never proved. A corpse found near the mouth of Niagara River was stated to be his, and as such was claimed by his family, but disinterred and believed to be some one else. Much political capital was made of the alleged abduction and drowning and it was averred that Thurlow Weed, a leader in the anti-Masonic movement (see ANTI-MASONRY), cynically said that it was «a good enough Morgan till after election,» a remark that has become proverbial for campaign deceit. Morgan's book ‹Illustrations of Freemasonry, by One of the Fraternity Who Has Devoted Thirty Years to the Subject› (1826) roused much less excitement than the story of his death. This book under the title ‹Free Masonry Exposed and Explained› was reprinted in 1912. Consult Greene, ‹The Broken Seal› (1870); Morris, ‹History of the Morgan Affair› (1852); O'Reilly, ‹American Political Anti-Masonry› (1879).

MORGAN, Fort. See FORT GAINES AND FORT MORGAN.

MORGAN CITY, La., city, port of entry, in Saint Mary's Parish, on the Atchafalaya Bayou and on the Southern Pacific Railroad, about 70 miles west by south of New Orleans, and 20 miles from the Gulf of Mexico. The place was formerly known as Brashear City. The Atchafalaya Bayou is navigable for steamers of light draught, and as it connects Grand Lake and the Gulf, Morgan City has steamer connections inland for some distance and with the principal Gulf ports. Considerable sugarcane is cultivated in the country around Morgan City. The chief industrial interests are connected with the cultivation of sugarcane, rice and with market gardening, fish and oysters. It has Oneonta Park in which are botanical gardens and a fine zoological collection. Water and sewage works are municipally owned. On 23 June 1863, a Confederate force of 3,000 soldiers under Richard Taylor captured the Federal garrison of about 1,000 soldiers. The Confederates secured property to amount to $2,000,000; but they soon abandoned the city, and the Federals again took possession. Pop. 5,477.

MORGANATIC MARRIAGE, a marriage between a prince or noble and a woman of inferior rank in cases where a perfect marriage is not legal except with a woman of equal rank. The distinctive feature of the morganatic marriage is that the wife does not acquire the rank of the husband, and the children, legitimate though they are, do not inherit it: in some states they do not inherit either entailed estates or personalty. In Great Britain under the Royal Marriages Act (1772) such a marriage is invalid in public law. A morganatic marriage and a regular marriage cannot exist at the same time, so that the Church regards the morganatic marriage as a perfect one. The custom originated in ancient German law, is prevalent among the princes and high nobility of that country and is also in force among the royal families of Europe.

MORGANFIELD, Ky., city, county-seat of Union County, on the Illinois Central Railroad, about 30 miles southwest of Evansville, Ind. It is in an agricultural region, in which tobacco is an important product. The principal industrial establishments are tobacco factories, flour-mills, carriage factories, brick yards and lumber-mills. It is the seat of Saint Vincent's Academy (R. C.). The city owns and operates the waterworks. Pop. (1920) 2,651.

MORGAN'S RAID INTO INDIANA AND OHIO. In the middle of June 1863 General Bragg ordered Gen. John H. Morgan, with 2,000 picked mounted infantry and four guns to move from Tennessee into Kentucky, break up the railroad upon which General Rosecrans depended for supplies, capture Louisville, destroy the public works and return to Tennessee as quickly as possible. Morgan determined to exceed his orders and make a raid north of the Ohio. On 2 July, with 2,460 men and four guns, he set out from Burkesville, crossed the Kentucky River in the face of Union troops guarding it, and marched northward, followed by all the Union detachments within immediate call. He passed through Columbia, after a sharp skirmish with about 300 Wolford's Kentucky cavalry, in which he lost about 40 in killed and wounded, and on the 4th reached Green River at Tebb's Bend, and demanded the surrender of Col. O. H. Moore, who, with about 300 men of the 25th Michigan, was guarding the bridge at that point. Moore replied that the Fourth of July was not a good day to surrender, and was instantly attacked with artillery and musketry. After a hard fight of three hours, in which Moore had six killed and 23 wounded, Morgan was repulsed, with a loss of 36 killed and 46 wounded, and drew off, crossing the river below the bridge. On the 5th he defeated and captured the small garrison of Lebanon and marched by Bardstown to Brandenburg, on the Ohio, where he arrived on the morning of the 8th, and seizing two steamboats began crossing his command. His passage was disputed by a gunboat and by militia with a field-piece on the Indiana shore, but by the morning of the 9th his whole command was in Indiana. Twenty-four hours later General Hobson, with 2,500 cavalry and mounted infantry and four guns, crossed the river in pursuit, and for 17 days hung upon Morgan's heels. Indiana and Ohio were aroused and turned out their militia by thousands. After crossing the Ohio, Morgan rode north through Corydon, where he was resisted by militia, who were soon overpowered. He then pushed on to Salem, where he captured nearly 400 militia, then through Lexington and Paris to Vernon, near which place on the evening of the 11th he encountered a stiff resistance from about 1,200 militia under Colonel Love. Under cover of darkness he withdrew from Love's front, and pressing on through Dupont and Sumansville, crossed the Indiana line on the 13th to Harrison, Ohio, and concentrated his command preparatory to making his way across the Ohio into Kentucky, detaching parties to burn bridges and confuse the pursuit, and impressing fresh horses. Under cover of a feint on Hamilton he marched by night a few miles north of Cincinnati, moving directly east, closely pursued next day by Hobson, who was marching 40 miles a day, and threatened from all directions by the militia. Turning toward Berlin, where the government had a large number of animals, he was confronted by a small body of militia under Colonel Runkle, lost much precious time in threatening an attack, drew off closely followed by Runkle, and after dark of the 18th reached the banks of the Ohio, a short distance above Pomeroy, near Buffington Bar and Blennerhasset's Island, where from the first he had planned to escape. His pursuers were closing in on him from every direction. On the west Hobson was hanging on his rear; General Judah, who had been withdrawn from Kentucky, had landed his division at Portsmouth, and was marching up from the southwest; regiments were coming down the river from Parkersburg; and gunboats patroled the river and watched the fords. Early in the morning of the 19th Morgan endeavored to cross the river, but was speedily checked. He was attacked in rear by the head of Hobson's column, Judah's cavalry struck him in flank and two gunboats opened upon his front. A severe engagement cost him about 120 killed and wounded, and more than 700 of his officers and men surrendered. Morgan with the remainder escaped up the river, where he attempted to cross to Belleville by swimming his horses. Three hundred men, under Colonel Johnson, had crossed when a gunboat stopped the remainder of the column, Morgan himself returning to the Ohio shore and with about 800 men retreating inland. He had lost all his artillery and trains. He pressed on northeast through Athens and Washington, marching 35 miles a day, burning bridges behind him, with General Shackelford and 500 men close upon his rear and skirmishing with it. Near Salineville on the 26th Shackelford's advance captured 250 men, and later in the day he was intercepted near New Lisbon and Beaver Creek, and surrendered with 364 officers and men. The Union loss in the campaign July 2–26 was 19 killed, 47 wounded and 8 missing. Consult 'Official Records' (Vol. XXIII); Duke, 'History of Morgan's Cavalry'; Senour, 'Morgan and His Captors'; The Century Company's 'Battles and Leaders of the Civil War' (Vols. III and IV).

E. A. Carman.

MORGANTE MAGGIORE. The 'Morgante Maggiore' of Luigi Pulci (1432–84), begun in 1460 and completed in 1483, is the first of the great Italian humoresque poems dealing with the material of the Old French epic, with the adventures and adventurers of the court of Charlemagne, with chivalry and deeds of valor, with Saracens, witches and magic, with all that distinguishes men from cowards and loyalty from treachery in a world of strong arms and generous appetites, good humor and simple passions. It is a reworking of an earlier popular poem called the 'Orlando,' with a few elements borrowed from another poem of the same cycle called the 'Spagna.' Pulci thus obtained the traditional schematic plot of the Italian chivalric tale: the struggle between the house of Clermont and the treacherous descendants of Ganelon, resulting in the slander of Orlando, his flight to the Orient, his adventurous battles with the Saracens, his return to Paris to raise the inevitable siege by the Saracens, his reconciliation with Charlemagne and ultimate vengeance on his enemies at court. Pulci is more faithful to the spirit and the substance of the Carolingian tale than either of his great successors, Boiardo or Ariosto, who utilized the more fantastic and sentimental legends of the Round Table to such an extent as wholly to transform the character of chivalric romance. The earnestness of the popular legend passed over directly into the 'Morgante,' to constitute the solid base for its pervasive humorism, on which the author then erects an original comic structure of his own, with not a few deliberately satiric elements. Neither Petrarchism nor classical models were strong enough in their influence on Pulci to alter or to vitiate this humorous attitude toward his subject. The reader willingly remembers three salient figures from the 'Morgante Maggiore': that of the giant Morgante himself, whose size and corresponding appetite for food have a jolly time getting along in this world made for smaller people; that of the half-giant Margutte, liar, thief, glutton, blasphemer, and all-around rascal of perennial good-nature, the most popular personage in the rambling story; and finally that of the devil Astaroth, who treats learnedly on orthodox theology, and among whose many feats of magic the most famous and startling remains his discovery of a new Western world some years before the voyage of Columbus. Save in its best episodes, the 'Morgante' is no longer much read. Popular in its own day, it helped to fix the direction of the efforts of Boiardo and especially of Ariosto, who used the chivalric legends as vehicles for an art more personal and powerful than that of Pulci. There is an English translation by Roscoe.

Arthur Livingston.

MORGANTOWN, N. C., town, county-seat of Burke County, on the Southern Railroad, about 80 miles west of Salisbury. In the vicinity are gold and silver deposits. It has lumber and cotton-mills, flour-mills, machine-shops and tanneries. It is the seat of the North Carolina School for the Deaf and Dumb and of the State Hospital for the Insane. It is a favorite health resort for people threatened with pulmonary diseases. Pop. 3,000.

MORGANTOWN, W. Va., city, county-seat of Monongalia County, near the northern boundary of the State, on the Monongahela River which is navigable throughout the year, and on the Baltimore and Ohio, the Monongahela River Railroad and the Morgantown and Kingwood Railroad, 100 miles south of Pittsburgh. Electric trolley lines with a city loop system reach all suburbs, in a region noted for extensive coal and oil fields, glass-sand deposits and limestone quarries, with abundant water power used for electrical manufacturing purposes. Chief of the manufacturing industries is the Sabraton plant of the American Sheet and Tin Plate Company established in 1908, employing 900 people with a payroll of over $1,000,000 a year; 12 glassworks employ 2,500 hands with an annual payroll of $2,040,000; and there are important brickworks, while coal is obtained from 40 mines; all producing a large export and local trade. Besides eight flourishing building and loan associations, Morgantown has six banks with an aggregate capital and surplus beyond $1,350,000 and deposits of upward of $4,500,000. The city has gas and electric-light and power plants. Morgantown's greatest industry is the West Virginia State University founded in 1868; its staff is about 200 people, its annual enrolment of regular students reaches 1,200, and of summer students in the agricultural schools 1,400. The library contains over 44,000 volumes. The university, in addition to the Morrell and Hatch funds appropriated by Congress, received from the State for 1919–20 appropriations of $1,250,000. Six commodious elementary and secondary schools and a high school furnish a perfect educational system. The leading religious denominations are represented by fine churches, including three for the colored population. Cheat River nearby is a summer resort of much scenic beauty and residential suburbs include Westover, Sabraton, Star City, Riverside and Granville. The first settlement was made in 1766 by Nicholas Decker, soon followed by the Morgan family, from whom it takes its name. Morgantown was incorporated in 1838 and received a city charter in 1901. Pop. (1920, U. S. official) 12,117.

MORGARTEN, mōr-gär'tĕn, Switzerland, a hill two miles west of Rothenthurm, on the margin of the lake of Egeri, on the confines of the canton of Zug, memorable as the scene of the battle of 15 Nov. 1315, in which a small body of Swiss mountaineers from Schwytz, Uri and Unterwalden, ill armed and undisciplined, totally vanquished an Austrian army of 20,000 under the Archduke Leopold, sent by Frederick the Fair to avenge the seizure of the abbey of Einsiedeln the previous year. This was the first victory achieved by the Swiss in their struggle for freedom.

MORGENSTERN, môr'gĕn-stĕrn, **Lina (Bauer)**, German writer and reformer: b. Breslau, 25 Nov. 1830; d. 1909. She did much social work in Berlin after her marriage (1854) to Dr. Theodor Morgenstern. She was leader of the woman's Verein (1860–66) in their farthering the cause of the Froebel Kindergärten, and (1866) she founded the Verein Berliner Volksküchen (public kitchens). In 1868 she started the Kinderschützverein, for the protection of children; in 1869 she founded an institute for the training of young women in the useful arts; in 1873 the Berlin Hausfrauenverein (housewives' league) for protection against extortionate prices and adulteration; it existed till 1883. In 1880 she established a woman's society for the rescue of immoral girls, placing them in schools to teach housework and farming. She wrote 'Das Paradies der Kindheit' (Berlin 1865; 6th ed., Regensburg 1904); 'Die Volksküchen' (4th ed., Berlin 1882); 'Der Beruf des Weibes' (1869); 'Die Frauen des 19 Jahrhunderts' (1888–91); 'Hilfsbuch zur Gründung, Leitung und Kontrolle von Volksküchen' (3d ed., 1900), besides several works on the systems of economical cooking. Since 1874 she published *Deutsche Hausfrauen Zeitung* and from 1888–94 a monthly publication entitled *Für junge Madchen*.

MORGENTHAU, môr'gĕn-thou, **Henry**, American lawyer, merchant and ambassador: b. Mannheim, Germany, 26 April 1856. He came (1865) to the United States and was educated at the New York public schools, studied at the College of the City of New York and was graduated at Columbia Law School, receiving the degree of LL.B. He became partner in the law firm of Lachman, Morgenthau and Goldsmith, New York (1879–99), was president of the Central Realty Bond and Trust Company (1899–1905), and of Henry Morgenthau Company (1905–13), dealers in realty. He was a director in the Underwood Typewriter Company, American Metal Company, and Equitable Life Assurance Society, and president of the Herald Square Realty Company. As a Democrat he has taken a very active place in his party and was chairman of finance committee of the Democratic National Committee 1912, 1916–20. He was Ambassador to Turkey (1913–16) and at the outbreak of war took charge of the interests in Turkey of Great Britain, France, Italy, Russia, Belgium, Montenegro, Serbia, etc., rendering invaluable assistance to these nations. He is president of the Free Synagogue, Bronx House (Settlement), and director of Mount Sinai Hospital.

MORGHEN, Raffaello, räf-fä-ĕl'lō môr-gĕn, Italian engraver: b. Florence, 19 June 1758; d. there, 8 April 1833. He received his early instruction in his art from his father, Filippo, and his uncle, Giovanni Elia, and was afterward placed as a pupil under the celebrated Volpato, whom he assisted in engraving the pictures of Raphael in the Vatican. The print which represents the miracle of Bolsena is inscribed with his name. He settled in Florence about 1793 as professor of copper-plate engraving in the Academy of Art. Here the grand-duke employed him to engrave Leonardo da Vinci's 'Last Supper,' which is painted on the wall of the refectory in the Dominican convent at Milan. This picture is faded and effaced, and the drawing which was made from it for Morghen was by no means worthy of the original; so that, though the engraver has given to the world an admirable print, he has failed in giving a correct idea of the work of Leonardo. In 1803 he was chosen an associate of the French Institute; and in 1812 was invited to Paris by Napoleon, who treated him with flattering kindness. Among the most remarkable of the other numerous works of Morghen may be noticed the 'Transfiguration' from Raphael; a 'Magdalen' from Murillo; a 'Head of the Savior' from Da Vinci; the 'Car of Aurora' from Guido; the 'Hours' from Poussin; the 'Prize of Diana' from Domenichino; the 'Monument of Clement XIII' from Canova; 'Theseus vanquishing the Minotaur'; portraits of Dante, Petrarch, Ariosto, Tasso, etc.

MORGIANA, môr-gĭ-ā'nạ, a female slave figuring in «Ali Baba and the Forty Thieves,» a story in the 'Arabian Nights Entertainment' (q.v.).

MORGUE, môrg (Old French, to look at solemnly), a place or building in large cities where the bodies of unknown persons who have perished by accident, murder or suicide are exposed, that they may be recognized by their friends. If not claimed within a certain period they are either buried or given over to medical institutions for dissection purposes. The name arose from the building in Paris, dating from the 5th century, devoted to this purpose.

MORI, Arinori, mō're ä-rē-nō'rē, Japanese statesman: b. Satsuma, 1848; d. 11 Feb. 1889. He was educated in England; as chargé-d'affaires in Washington arranged the postal convention between Japan and the United States; served as plenipotentiary in Peking and in London; and was Minister of Education from 1885 to his death. He was an extremely cultured man, with progressive educational ideas. On the day of the proclamation of the Japanese Constitution he was assassinated by a Shinto fanatic for violating a shrine at Ise by lifting the curtain with his walking stick.

MORIAH, mō-rī'a̤, Palestine, the hill on which the temple of Jerusalem was built (2 Chron. iii, 1), and by many authorities believed to be the mount on which Abraham was commanded to sacrifice his son Isaac (Gen. xxii, 2).

MORICE, Adrian Gabriel, Canadian clergyman, ethnologist and author: b. Saint Mars-sur-Colmont, Mayenne, France, 27 Aug. 1859. He was educated at Oisseau, Sion and Autun, France, joined the Oblate Order in 1877 and three years later was sent to British Columbia. In 1882 he was ordained to the priesthood, and for the following three years labored as missionary to the Chilcotin Indians at William's Lake. From 1882 to 1906 he was stationed at Stuart's Lake, B. C.; was then transferred successively to Kamloops 1906, Saint Boniface 1908, Winnipeg 1909, Duck Lake, Sask., 1910, and Winnipeg 1911. Since 1911 he has been lecturer in anthropology at the University of Saskatchewan. During his missionary career he mastered a number of Indian languages and compiled dictionaries and grammars of Chilcotin, Sekanais and Nahanais. He invented the Déné Syllabary and printed books in that language. He made maps during his wanderings up and down British Columbia. For one of these the Geographical Society of Paris awarded him a silver medal and another map was published by the provincial government. He is a member of the American Anthropological Association, the Historical Society of Saint Boniface, the Ethnological Committee of the British Association for the Advancement of Science, corresponding member of the Canadian Institute, the Geographical Society of Quebec and of many others in Canada and abroad. He is the author of 'Au pays de l'ours noir' (1897); 'History of the Northern Interior of British Columbia' (1904 et seq.); 'Aux sources de l'histoire manitobaine' (1907); 'Dictionnaire historique des Canadiens et des Métis français de l'Ouest' (1908); 'History of the Catholic Church in Western Canada' (2 vols., 1910). He collaborated in 'Encyclopædia of Religion and Ethics' and in 'The Catholic Encyclopedia.'

MORICHI, a palm. See MURICHI.

MORIER, mō'rĭ-ẽr, **James Justinian**, English diplomatist, traveler and novelist: b. Smyrna, about 1780; d. Brighton, March 1849. He was educated at Harrow, England, and entered (1807) the Persian diplomatic service and returned (1809) to England via Turkey, making a journey that became celebrated and a description of which he published under the title of 'A Journey through Persia, Armenia and Asia Minor to Constantinople in the years 1808 and 1809' (1812). Returning (1810) to Teheran as secretary of legation he made his journey (1815) back to Europe through Asia Minor and published another book entitled 'A Second Journey through Persia' (1818). After a trip to Mexico he settled in England and devoted himself to a literary life. Among his works are the Oriental novels 'Hajji Baba of Ispahan' (1824; new ed., 1914), perhaps his best work; 'The Mirza' (1842); 'Zohrab the Hostage' (1832); 'Ayesha, the Maid of Kars' (1834).

MORIER, Sir Robert Burnett David, English diplomatist: b. Paris, 1826; d. Montreux, 16 Nov. 1893. He was graduated (1849) at Balliol College, Oxford, entered (1851) the diplomatic service and served as attaché at the embassies of Vienna and Berlin. In 1865 he was appointed secretary of the embassy at Athens, then at Frankfort, becoming (1871) chargé-d'affaires at Stuttgart, and (1872) at Munich. In 1876 he was made English Minister at Lisbon, and at Madrid 1881–84, was appointed Ambassador at Saint Petersburg, 1884–93. In 1888 he was in a bitter conflict with Count Herbert Bismarck, who accused him of furnishing Marshal Bazaine with information as to the German advance over the Moselle at the outbreak of the Franco-Prussian War. Later it was proven that spies of the French government had obtained the information from other sources and that Bismarck's dislike was really caused through his knowledge of the diplomat's brilliant work. He was created K.C.B. (1882), privy councillor (1885), G.C.B. (1887), D.C.L. Oxford (1889).

MÖRIKE, mė'rĭ-kē, **Eduard**, German lyric poet and short-story writer: b. Ludwigsburg, Württemberg, 8 Sept. 1804; d. Stuttgart, 4 June 1875. His father was Kreis Medical Councillor Karl Friedrich Mörike, d. 1817; his mother Charlotte, née Bayer. He attended the Latin school at Ludwigsburg, the seminary at Urach (1818), where he made the acquaintance of Wilhelm Hartlaub and Wilhelm Waiblinger; and the divinity school at Tübingen where he came into contact with Ludwig Bauer, David Friedrich Strauss and F. T. Vischer. After completing his studies at these theological institutions, he spent the greater part of his life as a country pastor in various parts of Württemberg. His longest incumbency was at Cleversulzbach (1834–43), where he associated with Justinus Kerner, Hermann Kurz, Uhland and Karl Mayer. From 1851 to 1866 he taught literature at the Stuttgart Katharinenstift, receiving the title of professor in 1856. His first literary work was the short novel of artist life, 'Maler Nolten,' which passed through many revisions and was printed in its final form after his death (1877). His shorter stories are more finished artistically, especially 'Mozart auf der Reise nach Prag' (Stuttgart 1856). As a lyricist, no other Suabian poet attains his simple yet perfect form. His observations of life and of nature are realistic, and his depth of feeling sometimes approaches Goethe's. Some of his poems have even become favorites among the people, especially the ballad 'Schön Rotraut,' opening with the line: 'Wie heisst König Ringangs Töchterlein?'

JACOB WITTMER HARTMANN.

MORILLO, mō-rēl'yō, **Pablo,** Spanish general: b. Fuente de Malva, Spain, 1777; d. Madrid, Spain, 27 July 1838. He enlisted in the navy in 1797 and was engaged at Trafalgar in 1805; but when the French invaded Spain he left the navy to enter the army and rose to the rank of major-general in 1814. In 1815 he was sent to South America to subdue the revolution in Venezuela and Colombia, and after varying fortunes, during which he made for himself a name as a cruel and tyrannous general, perceiving defeat to be inevitable, he asked to be relieved but was compelled to sign a truce with the victorious Bolívar before sailing for Spain. He was appointed to command the garrison at Madrid, and in 1822 became captain-general of Galicia, which he surrendered to the French. He retired in disgrace to Rochefort, France, but returned to Spain in 1832 and led an army against the Carlists. During his exile in France he published his 'Mémoires' (1826).

MORIN, mō-răn, **Arthur Jules,** French mathematician and engineer: b. Paris, 19 Oct. 1795; d. there, 7 Dec. 1880. He was educated at the École Polytechnique in Paris and at the École d'Application at Metz, and was for a time professor of mechanics in the latter institution. In 1819 he became lieutenant in a battalion of engineers and later accepted a professorship at the Conservatoire des Arts et Métiers in Paris of which he became director in 1847. He held the rank of general in the army and was a member of various military boards, and his researches and inventions were of great scientific value. He published 'Aide-mémoire de mécamique pratique' (1838); 'Salubrité des habitations' (1868), etc.

MORIOKA, mō-rē-ō'kä, Japan, a town in the island of Hondo, 40 miles from the coast, and 339 miles by rail with Tokio. It is the capital of the prefecture of Iwate, in the northerly province of Rikuchu, has manufactures of silk, copper and other ware, and is celebrated for its fine fruits and vegetables (many of these of American origin) and preserves. Mount Iwate (6,800 feet) is in the vicinitv. Pop. 36,012.

MORISCOS, mō-rē'skōs, Spanish term applied to those Moors who accepted Christianity. After the fall of Granada (1492) many of the Moors returned to Africa. But most remained in Spain, permitted under pretense of conversion to Christianity and lived, under the name of Moriscos, as industrious, peaceful inhabitants, till they were driven to revolt by the cruel persecutions under Philip II (1568–70) and over 100,000 of them were exiled; the few remaining being now found in the mountains of Granada after Philip III (1609) deported another 500,000. Consult Rochau, 'Die Moriscos in Spanien' (Leipzig 1853); Boronaty y Barrachina, 'Los moriscos españoles y su expulsion' (Valencia 1901); Lea, 'The Moriscos of Spain' (Philadelphia 1901).

MORISON, George Shattuck, American civil engineer: b. Bedford, Mass., 19 Dec. 1842; d. New York, 1 July 1903. He was graduated from Harvard in 1863, and was admitted to the bar of New York in 1865. In 1867–73 he was engaged in engineering in Kansas, Michigan and Indiana, and then returned to New York, which he thereafter made his headquarters. He was an expert on railroad conditions and became famous as a bridge builder; constructing five bridges across the Missouri and 10 over the Mississippi, the greatest of these being the bridge at Memphis, Tenn., which has a single truss span of 790 feet. He was a member of the Isthmus Canal Commission (1898).

MORISON, James Augustus Cotter, English biographer and essayist: b. London, 1832; d. 26 Feb. 1888. He was graduated at Oxford in 1859, was a Positivist in philosophy, was one of the most brilliant contributors to the *Saturday Review* and one of the founders of the *Fortnightly Review.* He wrote 'Life and Times of Saint Bernard' (3d ed., 1877); brief biographies of Gibbon, Macaulay and Madame de Maintenon; 'The Service of Man: An Essay toward the Religion of the Future' (2d ed., 1887), which he regarded as his best work. His knowledge of French literature and history was profound.

MORISON, Robert, Scottish botanist: b. Aberdeen, Scotland, 1620; d. London, 10 Nov. 1683. He was graduated from the University of Aberdeen in 1638 but having borne arms as a Royalist in the Civil War, was obliged to take refuge in France when the cause of Parliament triumphed, and took the degree of doctor at Angers in 1648. From 1650 to 1660 he was superintendent of the garden formed at Blois by Gaston, Duke of Orleans. After the Restoration he was appointed by Charles II one of his physicians and botanist royal, and in 1669 became professor of botany at Oxford. His strong point as a botanist was in classification. His chief work is 'Oxford University History of Plants' (1680). Consult Pulteney, 'Sketches of the Progress of Botany' (1790); Sachs, 'History of Botany' (1906); Tournefort, 'Eléments de Botanique' (1797).

MORISONIANS. See EVANGELICAL UNION.

MORISOT, mō'rē-sō, **Berthe** (MADAME EUGÈNE MANET), French painter: b. 1840; d. 1895. As great-granddaughter of Fragonard she inherited from this great French painter his gracefulness, his spirited elegance and other fascinating qualities. Her natural talents she placed under the influence of Corot, Renoir, Dégas and Manet. Having married Eugène Manet, brother of the great painter, she exhibited with the «Impressionists,» but always signed her pictures Berthe Morisot, delicately respecting Manet's great name. She acquired her own reputation by distinguished and beautiful coloring and dash. She was as much admired for her beauty as for her talent. A French critic sums up her qualities as follows: «All her work is bathed in brightness, in azure, in sunlight; it is a woman's work, but it has a strength, a freedom of touch and an originality, which one would hardly have expected. Her water-colors, particularly, belong to a superior art: some notes of color suffice to indicate sky, sea or a forest background and everything shows a sure and masterly fancy, for which our time can furnish no analogy. A series of Berthe Morisot's pictures looks like a veritable bouquet, whose brilliancy is less due to the color-schemes which are comparatively soft (gray and blue) than to the absolute correctness of the values. A hundred canvases and perhaps 300 water-colors attest this talent of high mark. Normandy coasts, scenes with pearly skies and turquoise horizons, radiant gardens of Nice, fruit-laden orchards, girls in white dresses, with big hats wreathed in flowers, young women in ball-dresses and flowers are the favorite themes of this artist.»

MORITZ, mō′rĭts, **Karl Philipp,** German author: b. Hameln, 15 Sept. 1756; d. Berlin, 26 July 1793. He was born of poor parents and became one of the most extraordinary figures in the Sturm und Drang (Storm and Stress) period. After distressful attempts to gain a living he caught the attention of a patron in Hanover and entered the gymnasium to reach quick promotion, but soon accepted an engagement as actor under Ekhof at Gotha, failing in which he returned to study (1776) at Erfurt; but tiring again he joined the Herrnhuter (Moravians) at Barby, and studied theology at Wittenberg (1777); then taught philanthropy at the Potsdam military orphanage, soon again to take to wandering. Teaching in Berlin, he made a reputation as writer, preacher and poet, and went to England; then became professor at the Kölnisches Gymnasium; next tried editing the *Vossische Zeitung* to make it proletarian, but failed. Later, he traveled to Italy (1786) where he met Goethe, who made a favorable influence on his mind, and on his return to Germany he took up residence as Goethe's guest at Weimar. Duke Karl August aided him to a membership in the Berlin Academy of Sciences and he became (1789) professor of antiquities at the Berlin Academy of Art. He wrote much of his life's vicissitudes into his works, notably, ‘Anton Reiser’ (Berlin 1785–90), an autobiographical novel; ‘Andreas Hartkopf’ (ib. 1786), also contains other elements from his life. Other important works are ‘Versuch einer deutschen Prosodie’ (Berlin 1786; later ed., 1815); ‘Ueber die bildende Nachahmung des Schönen’ (Brunswick 1788; Heilbronn 1888) ‘Götterlehre’ (Berlin 1791 10th ed., 1851); ‘Reisen eines Deutschen in England’ (ib. 1783); ‘Reisen eines Deutschen in Italien’ (ib. 1792–93). Consult Dessoir, ‘Karl Philipp Moritz als Aesthetiker’ (Berlin 1889); Eibisch, Hugo, ‘Anton Reisers kritische Autobiographie’ (Leipzig 1909).

MORLAIX, môr-lā, France, capital of an arrondissement in the department of Finistère, picturesquely situated on two hills on the river Dossen, rendered navigable to the town. It is the junction of the West Railway and has two churches dating from the 15th and the 16th centuries, besides ancient wooden houses, a commercial court of justice, chambers of commerce and of agriculture, a college, theatre, museum, hydrographic school, etc. Its industries consist of a tobacco factory, hardware, leather and candle factories, besides import trade in coffee, lumber, stearic acid, fertilizers, wine, brandy, petroleum. It has also an export trade in butter, grain, cattle, eggs, vegetables, fish, etc. In 1911 its population was 15,262. It is the birthplace of the generals Moreau and Souvestres.

MORLAND, môr′land, **George,** English painter: b. London, 26 June 1763; d. there, 29 Oct. 1804. His father, himself a painter, gave the boy a severe early training in art, and his proficiency was such that his productions found ready purchasers, while at 10 he exhibited in the Royal Academy and became famous as a copyist of Dutch interiors. Soon after he rebelled against the strict discipline of his father's house, and entered upon a career of dissipation, in the company of stable-boys, money lenders, pimps and pugilists, supporting himself, meanwhile, by the pictures which he painted with amazing facility. So great was his productivity, that he was able to paint one or two pictures daily, and on one occasion completed a large landscape containing six figures, in six hours. The demand for his work was so great that dealers would take them before the oils had dried. In 1786 he took up his residence at Kensal Green, where he changed his mode of life and married the sister of James Ward, the animal painter, and William Ward, the engraver. Here he worked hard, and the moral subjects, after the manner of Hogarth, which he favored at this period, were engraved and became very popular. Soon again, however, he drifted back into his old habits, and, as his pictures were eagerly sought by the dealers, he was able for some time to carry on his reckless career. He had to make many changes of residence to avoid his creditors; and at length, in 1799, he was arrested for debt, but «obtained the rules of the Bench,» took a house within the bounds and continued to practise his art up to his release in 1802. In his later days he suffered from a palsied hand. Under arrest for debt, he died in a sponging-house. His epitaph for himself was, «Here lies a drunken dog.» The art of Morland is characterized by a picturesque representation of rural life in its homelier aspects, his rustic story being always happily conceived and skilfully told. He is one of the first genre and animal painters of the English school, and his reputation has increased of recent years. He painted about 4,000 pictures, 192 of which were engraved during his lifetime. Six of his best paintings are in the Kensington Museum, and the ‘Farmhouse Stable’ in the National Gallery is sometimes considered his masterpiece. The New York Historical Society possesses his ‘Old English Sportsman’ and ‘Dogs Fighting’; the Metropolitan Museum the ‘Midday Meal’ and ‘Weary Wayfarers’ and the Corcoran Gallery, Washington, ‘The Farmhouse.’ Consult Collins, W., ‘Memoirs for Picture’ (1803); and memoirs or biographies by Dawe (1807); Gilbert and Cuming (1907); Richardson, Ralph (1895); Williamson, G. C. (1904) and Wilson, D. H. (1907).

MORLAND, Sir **Samuel,** English inventor and diplomat: b. Sulhampstead-Bannister, Berks, 1625; d. Hammersmith, 30 Dec. 1695. He studied at Winchester School and at Magdalen College, Cambridge; was a tutor at Cambridge in Pepys' day; and about 1650 devoted himself to diplomacy. Cromwell sent him to Sweden in 1653; and in 1655 to the Duke of Savoy, to protest against the persecution of the Waldensians, in whose history he became deeply but none too intelligently interested, his ‘History of the Evangelical Churches of the Valley of Piedmont’ (1658), relying as it did to some extent on documents that were forgeries, being absolutely misinformed and unreliable. He was close in the secrets of Cromwell, and upon learning of Sir Richard Willis' plot against Charles revealed it to that prince. He then became privy to Charles' schemes, and was rewarded after the Restoration with a baronetcy. He then withdrew from public life, devoted himself to mechanical experiments, was one of the first to demonstrate the utility of steam power for propulsive purposes, improved the fire-pump or fire-engine, the lineal predecessor of the steam-engine, and invented a speaking trumpet. He wrote on cryptography, mathematics and mechanics.

MORLEY, Edward Williams, American chemist: b. Newark, N. J., 1838; d. Hartford, Conn., 24 Feb. 1923. He was graduated from Williams College in 1869. He was elected to the chair of chemistry in Western Reserve College, Hudson, Ohio (later Adelbert College, Cleveland), in 1869 and became professor emeritus in 1906. He was also professor of chemistry at Cleveland Medical College in 1873–88 and he was connected with various scientific societies. He retired in 1906 and removed to West Hartford, Conn. He was the inventor of an improved apparatus for gas analysis and published ‹Atomic Weight of Oxygen› (1895). Some of his scientific papers relate to atomic weight of oxygen; densities of oxygen and of hydrogen; variations in the amount of oxygen in the air; vapor density of mercury from 0° to 100°; analyses of igneous rocks.

MORLEY, Frank, American mathematician: b. Woodbridge, England, 9 Sept. 1860. He studied at Kings College, Cambridge, obtaining (1898) the degree of Sc.D. He was master of Bath College, England (1884–87), becoming (1887–88) instructor, then (1888–1900) professor of pure mathematics at Haverford College, Pennsylvania. He has been, since 1900, professor of mathematics at Johns Hopkins. He was editor of the *American Journal of Mathematics*, and wrote ‹Introduction to the Theory of Analytic Functions› (1898). In collaboration with Prof. James Harkness, he wrote ‹Elementary Treatise on the Theory of Functions› (1893).

MORLEY, Henry, English author: b. Hatton Garden, London, 15 Sept. 1822; d. Carisbrooke, Isle of Wight, 14 May 1894. Educated at King's College (London), he practised medicine in Somerset and Shropshire; taught at Manchester and Liverpool; was editorially connected with Dickens' periodicals, *Household Words* and *All the Year Round*; was for a time editor-in-chief of the *Examiner;* and in 1865 was appointed professor of English literature in University College, London. In 1878 he received a similar chair at Queen's College, London; and in 1882–90 was principal of University Hall, London. As a popular lecturer on literature he was much in demand. He edited ‹Morley's Universal Library› (1883–88); ‹Cassell's National Library› (1886–90); and the ‹Carisbrooke Library› (1889–91); published biographies of Palissy (1852), Jerome Cardan (1854) and ‹Cornelius Agrippa› (1856); and wrote ‹English Writers› (1887 et seq.); a smaller work on the same subject, ‹First Sketch of English Literature› (1873), a much-used manual and ‹Early Papers and Some Memoirs› (1891). He was an enthusiast in the popularising of good literature. Consult the ‹Life› by Solly (1898).

MORLEY OF BLACKBURN, VISCOUNT (JOHN MORLEY), English author and statesman: b. Blackburn, Lancashire, 24 Dec. 1838; d. London, 23 Sept. 1923. His father, a surgeon of repute, was a Yorkshireman, his mother a Northumbrian. He was straitly reared: «the rigors of Sabbatical observance forced on us a literary diet that neither enlightened the head nor melted heart and temper.» His early education was obtained at an Independent school in his native town, from which he went to University College School, London, where Joseph Chamberlain had preceded him, and then to Cheltenham College; there he won a scholarship at Lincoln College, Oxford, where he lodged in the rooms at one time occupied by John Wesley, the founder of Methodism. It had been intended that in due course he should take orders in the Church of England; but his life at Oxford had shaken his foundations. Although never formally a Positivist, he was profoundly influenced by the teachings of Comte; and in political economy he became a disciple of John Stuart Mill, and imbibed the «pure milk of the Millite ward» from the master himself. After graduation (1869) he embarked on a journalistic career, and in 1873 he was called to the bar of Lincoln's Inn, of which he was elected a bencher in 1891. He was on the staff of the *Saturday Review* and afterward edited the *Literary Review* (later the *Parthenon*). He succeeded George Henry Lewes as editor of the *Fortnightly Review* in 1867, and during his reign, which terminated in 1882, the magazine became noted, not only for its high literary standards, but for the diffusion of radical ideas in things temporal, and in things spiritual for its pronouncedly aggressive agnosticism. His contributors included the most illustrious names in the letters and controversies of the time. Morley also became reader for the publishing house of MacMillan, and edited the ‹English Man of Letters› series. In 1880 he became editor of the *Pall Mall Gazette;* and in that capacity began his long association with the Irish Home Rule cause, which throughout remained his chief political preoccupation; and he opposed the policy of coercion in Ireland which at this period found favor with the Liberal leaders. Morley had before this made two unsuccessful attempts to enter Parliament: in 1869 for Blackburn; and in 1880 for Westminster; and in 1873 had begun the friendship with Joseph Chamberlain which was to endure through life and the political identification with him which was finally to break in 1886. In 1883 he was returned for Newcastle-on-Tyne at a by-election, and his connection with journalism terminated. After the conversion of the Liberal party to Home Rule he accepted the post of Chief Secretary for Ireland on the formation of the brief Gladstone Ministry of 1886 — an appointment that was acceptable to the Irish Nationalists, because, unlike his leader and the majority of his colleagues, he had no political «past» to wipe out; and he became the trusted intermediary in the difficult and delicate negotiations between the Irish members and the Cabinet leading up to the introduction of the first and second Home Rule Bills. After the defeat of the measure of 1886 he, with the exception of Gladstone, came to occupy the chief place in the task of converting the English people to yield to the Nationalist claims. He again accepted the post of Chief Secretary in the Gladstone and Rosebery cabinets (1893–95); and on him fell to a large extent the task of adjusting and of piloting the Home Rule Bill of 1892 through the House of Commons. At the general election of 1895 he was defeated in the contest at Newcastle-on-Tyne — largely because of his refusal to vote for a statutory eight-hour day for miners; and in the following year he was elected for the Montrose Burghs — a seat he held until his elevation to the peerage in 1908. Between 1899 and 1903 he was half withdrawn from politics while engaged in the colossal task of writing the ‹Life› of Gladstone; but he condemned the diplomacy that had led up to the South African War and was pro-Boer in his sympathies. From 1905 to 1910 he was Secretary for India in the Campbell-Bannerman and Asquith cabinets, his tenure being noteworthy for reforms in administration and the introduction of Indians into the Councils of India; and throughout his term his relations with the governor-general, Lord Minto, were markedly cordial. After his resignation in 1910, he accepted the lighter post of Lord President of the Council, which he continued to hold until his retirement from public life on the outbreak of the Great War in August 1914, with the participation in which by Great Britain he was out of sympathy. Morley held for 30 years a conspicuous place in British public life; but, as was to be expected from his training and earlier work, he never became a great Parliamentary debater. But the transparent honesty of conviction which had earned for him the sobriquet of «Honest John,» the absence of overstatement and of superlatives, the profound thought and fine literary texture which marked his speeches, ensured for his utterances full reports, and they had considerable educative effect on the country. His tenure of the crucial Irish office — the most wearing and thankless of all posts and the grave of many reputations — was rendered only less difficult because he was in sympathy with Irish aspirations; and he was an undoubted success at the India office, where failure might have been anticipated. But his place in public life is secondary to his rank as an author. His writings include essays, studies of the French encyclopedists and political biography, and they bear the stamp of a rich, full, matured and balanced mind, which illuminates everything it touches. His works include ‹Edmund Burke› (1867); ‹Critical Miscellanies› (1871, 1877); ‹Voltaire› (1871); ‹The Struggle for National Education› (1873); ‹Rousseau› (1874); ‹On Compromise› (1874); ‹Diderot and the Encyclopedists› (1878); ‹Burke› (1879); ‹Studies in Literature› (1891); ‹Oliver Cromwell› (1900); and the standard and definitive ‹Lives› of Cobden (1881), and of Gladstone (1903); the last named one of the greatest biographies in the English language. A last work, ‹Recollections› (2 vols., 1917), covers his entire life. While not abating one jot from his characteristic views the volumes are written in a large and gracious spirit, and contain many intimate and delightful sketches of the most distinguished figures in letters and public life of his time.

Many honors came to him. He was a trustee of the British Museum after the year 1894; was elected (in succession to Lord Acton) an honorary Fellow of All Souls, Oxford, in 1902; was one of the first recipients of the Order of Merit founded by King Edward VII in 1902; served as the chancellor of Manchester University from 1908; and held numerous honorary degrees. He visited the United States in 1868 and 1904, on the last occasion as the guest of Mr. Andrew Carnegie; on the death of Lord Acton, Mr. Carnegie bought and presented his valuable library to Mr. Morley (1902), who in turn gifted it to Cambridge University; and in 1909 Mr. Carnegie gave Manchester University $50,000 to establish a chemical laboratory to be named after his friend. Consult Cecil, ‹Six Oxford Thinkers› (London 1909).

MORLEY, Margaret Warner, American educator: b. Montrose, Iowa, 17 Feb. 1858; d. Washington, D. C., 10 Dec. 1923. She was graduated from the Normal College of New York in 1878 and taught in the Oswego Normal School and in the normal school at Milwaukee, Wis. She was for a time engaged in Armour Institute as teacher of biology. She published ‹A Song of Life› (1891); ‹The Bee People› (1899); ‹Wasps and Their Ways› (1901); ‹The Insect Talk› (1903); ‹Butterflies and Bees› (1905); ‹Grasshopper Land› (1907); ‹Donkey John of the Toy Valley› (1909); ‹The Apple-Tree Sprite› (1915); and other works intended to familiarize young people with science.

MORLEY, Samuel, English philanthropist: b. Homerton, England, 15 Oct. 1809; d. near Tunbridge, Kent, England, 5 Sept. 1886. He engaged in hosiery manufacture in Nottingham and amassed a large fortune, which he used in philanthropic enterprises. He represented Bristol in Parliament in 1868–85 and upon his retirement was offered a peerage which he declined. In Parliament he supported various religious and social reforms and was opposed to capital punishment. He was one of the chief proprietors of the London *Daily News*, and was instrumental in reducing its price to one penny.

MORLEY, Thomas, English composer: b. 1557; d. London, about 1604. He may have been trained as a choir boy in Saint Paul's; was a pupil of Byrd; studied music at Oxford; from 1591 to 1592 was organist of Saint Paul's; in 1592 was appointed gentleman of the Chapel Royal and in 1598 he was given the exclusive right of printing books of music and selling ruled paper. He is best known by his ‹Booke of Aires› (1600), which contains the page's song in Shakespeare's ‹As You Like It› (‹It was a Lover and his Lass›), with the original music. Morley's ‹Plaine and Easie Introduction to Practicall Musicke› (1597), in dialogue form, is the earliest regular treatise on music published in England.

MORLEY, England, municipal borough in West Riding, Yorkshire, between Leeds and Dewsbury. It has two Gothic Anglican churches as well as others of different denominations, a very modern town-hall and a park. Its important industries are woolen goods, textile machinery, coal mining, stone quarrying, etc. Domesday Book mentions Morley. The borough was incorporated in 1885. The population in 1911

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was 24,282. Consult Smith, 'Morely, Ancient and Modern' (London 1886).

MORMON CRICKETS, Western names for two species of longhorned, wingless, migratory (*Anabrus simplex*, and *A. purpurascens*), which are especially destructive at times in Montana and Idaho. See GRASSHOPPERS.

MORMONS, a popular pseudonym for The Church of Jesus Christ of Latter-Day Saints, a religious body founded by Joseph Smith (see SMITH, JOSEPH) at Fayette, N. Y., 6 April 1830. Only six persons took part in the formal organization of the Church as a body corporate, such being the minimum requisite under the laws of the State, but the entire number of adherents at the beginning comprised only a few more. The founder averred that in 1823 he was visited by an angel, who revealed to him the repository of certain records, engraved on plates of gold, buried on the side of a hill near Palmyra, N. Y., and said by the angel to contain the history of the aboriginal peoples of the Western Continent. In 1827 these plates were delivered by the angel into the custody of Joseph Smith, with the assurance that through divine assistance he would be enabled to translate the records, to which labor he was specially appointed. With the plates were two stones set in bows of silver, and these, according to the angel's statement, were the Urim and Thummim, the power to use which constituted the special attribute of the seers of ancient days. Smith avowed that by the aid of these instruments under the inspiration of God he was able to read the ancient inscriptions, which consisted of characters said in the body of the record to be Reformed Egyptian and to dictate an exact rendering thereof in the modern tongue. In 1830 he published an English translation of the plates under the title 'The Book of Mormon,' and the work has been distributed by millions of copies through later editions in English and in numerous foreign languages. In every copy appear as separate affidavits the «Testimony of Three Witnesses» and the «Testimony of Eight Witnesses,» in which the signers solemnly affirm their personal knowledge as to the plates, the engravings thereon and the genuineness of the translation; and it stands as a remarkable fact that although most of these witnesses apostatized from the Church, or were excommunicated, and though they developed bitter animosity against Joseph Smith, everyone of them stoutly maintained, even unto death, the truth of his testimony concerning the 'Book of Mormon.' The book sets forth that in the first year of the reign of Zedekiah, king of Judah, 600 B.C., an Israelitish prophet named Lehi, together with his family and parts of other families, migrated from Palestine to America under divine direction. In the New World the colony multiplied rapidly; but in course of time the people were rent by dissension and formed two opposing nations, known in the record as Nephites and Lamanites. The former, named after their first chief, Nephi, a younger son of Lehi, cultivated the arts of civilization, built cities in South, Central and North America, and through succession of duly appointed recorders kept a history of their doings. This historical record as later abridged in part and summarized by Mormon, one of their prophets, is the original of the 'Book of Mormon.' The Lamanites, named after Lehi's eldest and rebellious son, Laman, led a nomadic life, neglected agriculture and productive industry and relied for subsistence upon war and the chase. They came under the predicted curse of darkness, specifically marked by a ruddy skin, and their degenerate posterity are the American Indians. The enmity of the Lamanites toward the Nephites culminated in the utter extermination of the latter at about the close of the 4th century, the final struggle being waged in the region now known as northern New York and near the Hill Cumorah, in which the Nephite records were in modern time disclosed to Joseph Smith. The Book of Mormon story, therefore, is seen to cover a period of approximately a thousand years. The Nephites were observers of the Law of Moses, a copy of which together with other Old Testament Scriptures had been brought by Lehi and his colony from Jerusalem. The birth, earthly ministry, death and resurrection of Jesus Christ were predicted by Nephite prophets; and the 'Book of Mormon' contains the record of the personal visitation of the resurrected Christ to these «sheep» other than of the Jewish fold, soon after the Lord's ascension from Olivet. Among them the Christ established His Church, prescribing the same ordinances, such as baptism by water and of the Spirit, the sacrament of bread and wine, etc., as were instituted among the Jews, and ordaining a body of 12 disciples to whom He gave commission to preach the Gospel and administer the ordinances thereof. Mormon's son, Moroni, finished the record of his people about 420 A.D.; and the angel who in 1823 revealed the depository of the plates to Joseph Smith announced himself as that same Moroni, the last prophet and historian of the ancient nation. Years after the first publication of the 'Book of Mormon,' a story purporting to explain the modern origin of the book, as a plagiarized and altered version of a work of fiction, attracted some attention; but the theory has been abandoned as utterly untenable. See BOOK OF MORMON.

From the day of its organization in 1830 the Church grew with surprising rapidity; and from that time to the present every year has witnessed an increase in membership and an expansion of propaganda. A temporary gathering centre was established at Kirtland, Ohio, where the first temple was reared. This building, an imposing structure as judged by the standard of the time, was dedicated in 1836. As early as 1831, however, the Mormons had begun to establish themselves in Jackson County, Mo., which region they still regard as the central place of the land of Zion. Persecution was waged against the Church from its beginning. Both in Ohio and Missouri the people met violent opposition. In 1833 they were driven from Jackson County, under cover of a charge that they were abolitionists. They sought refuge in Clay County, but their sojourn there was brief. In 1838 Gov. Lilburn W. Boggs of Missouri issued an exterminating order against all Latter-day Saints, and they were forcibly expelled from the State. In sorry plight the people turned again eastward and settled in Illinois, making the little village of Commerce in Hancock County their headquarters. There they founded the city of Nauvoo, the phenomenal growth of which attested at once the industry and skill of the people and the vitality of their organization. Nauvoo was chartered by the State with liberal provision for local government. A university and a military organization were provided for, and both institutions were successfully established. The city flourished and in time numbered 20,000 inhabitants. A temple was reared, in proportions and beauty of architecture far surpassing the earlier structure in Kirtland. In 1844 a few apostates from the Church started a newspaper at Nauvoo with the avowed purpose of assailing the prophet and exposing alleged misdeeds. Only one issue of the paper was published. The city council of Nauvoo promptly declared the printing establishment a nuisance and ordered its immediate abatement. In the seizure by officers of the law the printing plant was wrecked. Smith was blamed for this by his enemies and they secured the issuance of a warrant for his arrest. As he was the officially recognized commander of the Nauvoo Legion, a duly constituted unit of the militia, the imminence of a military clash was exploited and public opinion in the State became intensely antagonistic. The governor of Illinois induced Smith to surrender himself under assurance of safeguard against mobocratic violence. The prophet was imprisoned at Carthage, where on 27 June 1844 a mob broke into the jail and shot to death Joseph Smith and his brother Hyrum, and wounded John Taylor, one of the prophet's party.

Even this outrage failed to bring about the end of Mormonism. Joseph Smith was succeeded in the leadership of the Church by Brigham Young (see YOUNG, BRIGHAM), who, early in 1846, was impelled through the violence of persistent persecution to leave Nauvoo with his people. They set out for the West. A party numbering 143, led by Young, started in the spring of 1847, and on 24 July arrived in the valley of the Great Salt Lake, which region the leader declared to be the land of promise to the Saints. To ordinary view the promise was most uninviting. The pioneer band placed a dam across the little stream later known as City Creek and flooded a small area of the hard-baked soil. After the planting the land was again watered. Thus was inaugurated the system of modern irrigation in America. The first crop raised by the colonists was small and the next was partly destroyed by an invasion of crickets; but the people pushed out into the remoter parts of the valley and beyond; and within a few years the wilderness — a part of the Great American Desert — was blossoming as a flower garden. The site of the present Salt Lake City was surveyed, streets laid out, the Temple block was marked by boundaries and other reservations for community use were made. Brigham Young returned to Council Bluffs, Iowa, where the main body of his people had established temporary headquarters. The migrating hosts followed the route of the pioneer band, traveling in well-organized companies; and people still living in the smiling vales of Utah and contiguous States relate their experiences of having crossed the plains afoot, guiding ox teams or pushing handcarts by dint of strenuous effort. Great Salt Lake City, as the new settlement was first called, became at once important on account of its position on the route of wagon trains between the Missouri River and California; and as within two years from the time of the pioneer arrival, the gold fever was raging, travel was heavy. As a result of the wonderful genius for organization, management and well-disciplined activity exhibited by the Mormon colonists, and owing to their success in irrigation, the soil, inherently fertile and lacking only water and skilled cultivation, yielded abundantly and the city became the chief source of supply to the transcontinental travelers. When settled by the Mormons the region was under Mexican sovereignty. After its cession to the United States in 1848, under the Treaty of Guadaloupe Hidalgo, the settlers petitioned for admission to the Union as a State; the request was denied, but in 1850 the Territory of Utah was formally established. Brigham Young was appointed governor and Congress made appropriations to the new Territory for public buildings and a library. In 1857 Alfred Cumming was appointed to succeed Brigham Young as governor, and Cumming with other Federal appointees was sent to the West along with «Johnston's army,» a military expedition authorized by President James Buchanan, and sent ostensibly to suppress a «Mormon rebellion» that had no existence except as a popular opinion based on false reports. The expedition met with difficulties on account of the inclement season, and through determined opposition on the part of the Utah settlers to having an armed and hostile force sent against them in time of peace, when, as they claimed, they were guiltless of any overt act against the United States government. A peace commission was sent to Utah in 1858 and the people, who had already begun to move away from their homes (which they had prepared to burn if the invading soldiery attempted any depredations) were induced to return. Brigham Young, though no longer governor, exercised great influence in the Commonwealth. Many missionaries were sent out by the Church and the membership increased with great rapidity. Brigham Young died in 1877 and John Taylor succeeded him in the presidency of the Church. Taylor had been with the Smiths at the time of the assassination in Carthage jail and he himself had been shot and dangerously wounded by the mob. John Taylor died in 1887; and, after an interval, Wilford Woodruff became president of the Church. He was a remarkable man, 82 years old when made president, and he retained his physical and mental vigor until his death, which occurred in his 92d year. In 1890 President Woodruff issued his famous manifesto, which placed a definite injunction against plural or polygamous marriage, which practice had been inaugurated under prescribed regulation by Joseph Smith at Nauvoo. In 1896 Utah became a State, and in the following year the 50th anniversary of the entrance of the pioneers into Salt Lake Valley was impressively celebrated. Lorenzo Snow became president of the Church following the death of President Woodruff in 1898. He was in his 85th year at the time and died three years later. He was succeeded by Joseph Fielding Smith, a nephew of Joseph Smith, the martyred prophet, and son of Hyrum Smith, who had met death with his brother Joseph. After an administration covering 17 years and marked by unprecedented expansion in all phases of Church activity, Joseph F. Smith died on 19 Nov. 1918, a few days after his 80th birthday. On 23 Nov. 1918 Heber J. Grant, the senior member of the apostolic body, was made president of the Church on the second day of his 63d year.

From the seemingly insignificant beginning of six the membership of the Church has now risen above half a million. In Utah and adjoining States, as also in Canada and Mexico, the people are organized according to residence into stakes, each of which comprises several wards; and outside the area so included, the whole of this country, as also many foreign lands, are covered by missions. The theology of Mormonism is epitomized in the following exposition:

The Articles of Faith of the Church of Jesus Christ of Latter-Day Saints.

1. We believe in God, the Eternal Father, and in His Son, Jesus Christ, and in the Holy Ghost.
2. We believe that men will be punished for their own sins, and not for Adam's transgression.
3. We believe that through the atonement of Christ, all mankind may be saved, by obedience to the laws and ordinances of the Gospel.
4. We believe that the first principles and ordinances of the Gospel are: (1) Faith in the Lord Jesus Christ; (2) Repentance; (3) Baptism by immersion for the remission of sins; (4) Laying on of hands for the gift of the Holy Ghost.
5. We believe that a man must be called of God, by prophecy, and by the laying on of hands, by those who are in authority, to preach the Gospel and administer in the ordinances thereof.
6. We believe in the same organization that existed in the Primitive Church, viz.: apostles, prophets, pastors, teachers, evangelists, etc.
7. We believe in the gift of tongues, prophecy, revelation, visions, healing, interpretation of tongues, etc.
8. We believe the Bible to be the word of God, as far as it is translated correctly; we also believe the Book of Mormon to be the word of God.
9. We believe all that God has revealed, all that He does now reveal, and we believe that He will yet reveal many great and important things pertaining to the Kingdom of God.
10. We believe in the literal gathering of Israel and in the restoration of the Ten Tribes; that Zion will be built upon this (the American) continent; that Christ will reign personally upon the earth; and, that the earth will be renewed and receive its paradisical glory.
11. We claim the privilege of worshiping Almighty God according to the dictates of our own conscience, and allow all men the same privilege, let them worship how, where, or what they may.
12. We believe in being subject to kings, presidents, rulers, and magistrates, in obeying, honoring, and sustaining the law.
13. We believe in being honest, true, chaste, benevolent, virtuous, and in doing good to *all men;* indeed, we may say that we follow the admonition of Paul. We believe all things, we hope all things, we have endured many things, and hope to be able to endure all things. If there is anything virtuous, lovely, or of good report or praiseworthy, we seek after these things.— Joseph Smith.

The presiding council of the Church is the first presidency, consisting of the president and his two counsellors, each of the three being an ordained high priest. The president is officially designated as «prophet, seer, and revelator» to the Church. Next in authority is the council of 12 apostles, and in addition there are patriarchs, high priests, seventies, elders, bishops, priests, teachers and deacons, the organization operating as a theocratic system. Auxiliary organizations are maintained as helps in government; these comprise relief societies, Sunday schools, young men's and young ladies' mutual improvement associations, primary associations for the children and religion classes for supplying religious and ethical instruction as a supplement to the secular teachings of the public schools. A system of church schools is operated for those who prefer denominational training, and these institutions range from the kindergarten to the normal school and college. The practice of plural marriage was a feature of the Church from the time of Joseph Smith's presidency to that of Wilford Woodruff. In 1862 the Federal government legislated against the system, but the constitutionality of the law was contested by the Mormons on the ground that it was in effect an infringement on religious freedom. More stringent laws followed, and numerous prosecutions resulted. Many members of the Church suffered fine and imprisonment rather than abandon the wives with whom they had covenanted under Church sanction. In 1887 the Mormon Church was disincorporated by Congress and the greater part of its property was confiscated by the government. In recognition of the final decision of the Supreme Court that the laws forbidding a plurality of wives were constitutionally valid, the Church in general conference assembled adopted as a binding rule the Woodruff manifesto; and except for sporadic cases of violation of this rule of action, plural marriage has ceased to be an issue in Mormon affairs. In 1898 Brigham H. Roberts was elected to Congress on the Democratic ticket, but a protest followed on the charge that he was living in polygamous relations, and on the recommendation of an investigating committee of the House of Representatives he was denied a seat in Congress. In 1904 an effort was made to unseat United States Senator Reed Smoot, on the charge that he, being a member and an official of the Mormon Church, did in effect abet and encourage the practice of plural marriage, and that he was disloyal to the Federal government. Both charges failed and the senator was confirmed in his place in the upper house of Congress.

Salt Lake City, which is still the headquarters of the Mormon Church, and both capital and metropolis of the State of Utah, is famed for its beauty of situation, its wide and excellent streets and its many imposing structures. The great tabernacle, a building begun in 1864 and completed in 1867, is oval in plan, 250 feet long, 150 feet in greatest width and over 70 feet high from floor to ceiling at the centre. The roof is a great dome of lattice-work construction and is self-supporting, the vast span being without a single pillar. As first constructed the enormous beams and trusses, entirely of wood, were held together by wooden pegs and rawhide thongs, for in that day iron spikes were unobtainable. The seating capacity of the building is over 9,000; but, with aisles and other standing space occupied, assemblies of nearly 11,000 are not uncommon. The great organ in the tabernacle is of world-wide fame, and the choral service is scarcely less renowned. The temple is built of solid granite, with walls eight feet thick in the first story and six feet above. This building was begun in 1853 and was dedicated in 1893, the time occupied in its construction being 40 years to the day. It is of composite architecture, with dimensions of 186 feet length, 118 feet width and 210 feet from ground to highest pinnacle. There are three other temples in Utah, one in Canada and one in Hawaii. The temples are used in ordinance work and not for worshiping assemblies in general. A characteristic of Mormon practice is the rendering of vicarious service in baptism and other ordinances for the dead; and this labor is performed only within temples erected and dedicated for the purpose. Ordinances for the living are likewise administered in these structures; and the distinctive ceremony of «celestial marriage» is confined to the temple administration. This order of marriage involves a covenant between the parties for time and all eternity, and not only until death shall them part. No marriages are solemnized in the temples or elsewhere among the Mormons except such as are authorized by the license of the State. See SALT LAKE CITY; UTAH.

MORMYRIDÆ, môr-mĭr'ĭ-dī, from the Greek *mormyros,* sea-fish. They are known as the *African-beaked fish* of the pike family, but, by Professor Cope, applied to the *Scyphophori.* They have the narrow parietal bones of the skull distinct both from one another and from the supraoccipital and they have the special distinction of having the pteratics (on each side of the parietals) large, funnel-shaped and enclosing a cavity expanding externally and covered by a lid-like plate of bone. The anterior vertebræ are simple and unmodified and the gill cover has a sub-opercular bone. Scales cover both body and tail, but the head is naked and barbels are absent on muzzle. The central portion of the upper jaw is formed by the united premaxillæ and the sides by the maxillæ. A small slit represents the gill opening and there are no false gills. The air bladder is simple. The beaked fishes are divided into two groups, the Nile having 11 species.

MORMYRUS, a fish of the Nile (*Mormyrus petersi*), regarded as excellent for the table, and caught with line and hook. Its lower jaw is extended into a fleshy appendage and its characteristic form is depicted on ancient Egyptian wall-paintings and carvings. It represents a group of malæopterous nocturnal North African river-fishes allied to the pikes.

MORNAY, Philippe de, fē-lēp dė môr-nā, SEIGNEUR DU PLESSIS-MARLY, French statesman: b. Buhy, Normandy, 5 Nov. 1549; d. La Forêt-sur-Sèvre, 11 Nov. 1623. He was brought up a Huguenot; entered Coligny's service; escaped to England at the time of the Massacre of Saint Bartholomew; returned to France in 1573, and took up arms for the Huguenots; was captured at the siege of Dormans and afterward ransomed, and joined the army of Henry of Navarre, who used not only his sword but his pen and his diplomatic gifts, made him a member of his council and appointed him governor of Saumur. After Henry became Henry IV of France and a Catholic, Mornay was the sole Huguenot leader and was even styled the «Huguenot pope» by his enemies. He retired to Saumur (where he founded a Protestant university) soon after the Edict of Nantes, in the negotiations leading up to which he had taken a leading part. Mornay wrote, among other controversial works aimed now at pagans or atheists, now at the Roman Catholic Church, 'De l'Eucharistie,' urging the Calvinistic view of the Lord's Supper as opposed to transubstantiation (1598). His 'Mémoirs pour servir à l'Histoire de la Réformation en France,' re-edited in 1824, is a valuable source for the history of the period. His wife's memoirs (1824) detail his life down to 1606. Consult also Ambert, 'Duplessis-Mornay' (Paris 1847), and Baird, 'The Huguenots and Henry of Navarre' (New York 1886).

MORNING-GLORY, an annual twining or trailing vine (*Ipomœa purpurea*) or some related species (a native of South America), popular as a garden ornament all over the world and often found escaped to the fields and roadsides. The vine is sometimes 10 feet tall, with large roundish heart-shaped leaves and large delicate ephemeral flowers of very various forms and colors. The seed may be sown in any garden soil well exposed to the sun, where the plants may be expected to grow the following year. They self-sow readily. If the soil is very rich they increase so fast as to make an excellent screen for a low porch by midsummer. See CONVOLVULACEÆ; IPOMÆA.

MORNINGSIDE COLLEGE, in Sioux City, Iowa; coeducational; founded in 1894, under the auspices of the Methodist Episcopal Church. The school has an average of 41 professors and instructors and about 1,243 students. There were 28,000 volumes in the library; the grounds, building and apparatus were valued at $157,000; the income was $33,000, not including benefactions. The collegiate courses lead to the degrees of A.B., B.S. and Ph.B.

MORNY, môr-nē, **Charles Auguste Louis Joseph,** DUC DE, French politician: b. Paris, 23 Oct. 1811; d. there, 10 March 1865. He was a half-brother of Louis Napoleon (afterward Napoleon III), a natural son of Queen Hortense and Count Flahault. He was for a time in the army, then tried commercial speculation and finally politics. He became a deputy in 1842, took a prominent part on the side of Napoleon III in the *coup d'état* of 1851, and was a conspicuous figure under the Second Empire, during which he was Minister of the Interior (1851–55), president of the Corps Législatif (1854–65), and was sent on a special embassy to Saint Petersburg (1856–57) and was created duke in 1862. Possessed of a certain sort of ability, he employed it with perfect unscrupulousness for the advancement of his personal interest. Alphonse Daudet (who for a time served as one of his secretaries) has portrayed him as the Duc la Mora in 'Le nabab.' Consult the biographies by Castille (Paris 1859) and Loliée' (English trans., New York 1910).

MOROCCO, mō-rŏk'ō, or **MAROCCO,** a sultanate or empire and French protectorate of northwest Africa, known to its inhabitants only by its Arabic name Moghrebel-Aksa, «The Extreme West.» It is bounded on the west by the Atlantic Ocean, north by the Mediterranean Sea, northeast by Algeria and east and south by the Sahara, the boundary in the southwest being formed by the Wady Draa, while elsewhere there is no definite line of demarcation between the French Sahara and Morocco; area, about 219,000 square miles. The rulers of Morocco exercised sovereignty at one time over Twat, or Touat and several other oases in the heart of the desert; they even carried their victorious arms across the desert to Timbuktu. Within recent times, however, they have had little or no power south of Atlas, the great chain which traverses the country diagonally northeast to southwest throughout its whole extent. Morocco has three capitals or imperial residences, at one of which the sultan and his army reside at uncertain intervals and for indeterminate periods. These are Fez (pop. 100,000), Makinas or Mequinez (30,820), Marrakesh, better known as the City of Morocco (50,000 to 80,000). Besides these the principal coast towns are Tangier (46,000, 11,000 European); Tetuan, a little way up the Martil River; Larache (El-Arish); Rabat and Sallee, on opposite sides of the Bu-Ragreb River; Casablanca or Dar-al-Baida (75,000, 31,600 European); Mazagan, Saffi and Mogador. The empire is divided into districts named from the occupying tribes; another division is into provinces or districts, fluctuating and very unequal in number, sometimes confined to a single town, sometimes embracing an extensive territory, administered each by a *kaid,* whose chief duty it is to collect the imposts.

Topography.— Physically considered, Morocco falls naturally into four regions: 1. The great range of Atlas, from southwest to northeast, composed of two or more parallel chains. (See ATLAS). 2. Er-Ríf or the northern maritime district, comprising the chains of mountains which rise at no great distance from the Mediterranean Sea. 3. The wide belt of fertile plain, intermixed with gentle hill and valley, which lies between the two preceding regions. 4. The plains and valleys southeast of Atlas. The most remarkable natural feature is the great mountain system extending from northeast to southwest. This system — the Atlas — composed of several parallel chains, contains the most elevated points known in North Africa. Miltsin, a peak distant about 30 miles southeast from the city of Morocco, has a height of 11,400 feet, while another peak, Jebel Ayashin, is estimated at 14,600. Adjoining the central chain are several table-lands of great extent, consisting of irregular plains, and at a little distance from it north extends the maritime chain now called Er-Ríf, and formerly the Atlas Minor. Its general height is from 2,500 feet to 3,500 feet.

Hydrography.—The rivers flowing from the north side of the Atlas have generally the shorter course, but are well supplied with water; those running south, however far they may extend, are dry in summer, at least in their lower courses. The Muluya, rising in a principal knot of the Atlas flows in a northeasterly direction to the Mediterranean with a course of 350 miles and receives many tributaries. Of the rivers which run into the desert the most easterly the Ghir has a course southeast, occasionally traceable for 300 or 400 miles. The Ziz, which, with its numerous affluents, waters a very fertile and populous country, is wholly spent before it attains half that length. The Draa which rises in the central and most elevated portion of the range of Atlas (lat. 31° to 32° N.), first runs south for nearly 200 miles, forms Lake Ed-Debaya, and then, turning west, enters the ocean in lat. 28° 18′ N., after a course of 700 miles. The lower portion of its bed, however, is periodically quite dry. Lake Ed-Debaya, formed by the floods of the Draa, is reported to be very large; but it disappears annually, and gives way to richly cultivated fields. The fresh-water lake of Gebel el Akhdar (Green Mount) lies about 30 miles north of Morocco. The coast offers few good harbors; of these Tangier and Mogador, or Sweira, are the best; the rest are but open roadsteads at the mouths of rivers.

Natural Resources, etc.— The extent of the mineral wealth possessed by Morocco is not known with any accuracy. Copper, iron, and lead are obtained in larger or smaller quantities. The flora of Morocco includes the esculent oak and cork oak; in the higher regions of the Atlas the cedar and Aleppo pine, with many varieties of oxycedrus and juniper yielding fragrant gums; also the date-palm and the dwarf-palm east and south of the Atlas; and near the coast the *Eleodendron argân,* which yields an excellent oil. Among the wild animals are lions, panthers, ounces, wild boars, gazelles and several species of large antelope, especially the bubalus. The locust makes its appearance in May, when it lays its eggs. The young brood come forth a month later in countless multitudes, and in another month they take wing, consuming all vegetation in their progress and spreading desolation over the fields. They are gathered and eaten in large quantities. The ostrich is found on the south frontiers of Morocco.

Climate.—The climate west of Atlas is much more temperate than might be expected under such low latitudes. This is due to the circumstance that a lofty chain of mountains, covered in some parts with perpetual snow, intercepts the hot winds from the deserts of the interior, so that the equable and refreshing sea-breezes prevail throughout the year. Hence the extremes of temperature lie within moderate limits; the thermometer rarely falling below 40° F. in the winter, while it does not rise above 95° in summer. In the region east of the mountains intense cold is felt in winter, while in summer the heat of the plains is insufferable.

Agriculture.— The agriculture of Morocco was in the lowest possible condition and the annual production calculated barely to supply the wants of the country; though with proper cultivation and under an enlightened government Morocco will become one of the most productive countries in the world. Unfortunately, until the French protectorate was established, owing to oppression and extortion, there was nothing but discouragement for anyone attempting to reap advantage from these resources. The cereal crops are wheat barley and maize; but durrah or millet (*Sorghum vulgare*) constitutes the chief support of the population, though beans, the esculent arum, and even canary seed are much eaten by the poorer classes. Cotton growing was introduced in 1911. The vine was cultivated only near towns for the sake of the fresh grapes and for the raisins; but now the outlook for this product is promising. All the fruits of the south of Europe are cultivated to some extent. Large numbers of the inhabitants lead a pastoral life, subsisting wholly on the produce of their herds and flocks, or else on game and the wild fruits of the forests. The chief wealth of the tribes scattered over Morocco consists in their herds and flocks. The spirited small horses, for which the country was famous in ancient times, are still numerous, particularly in the southern provinces. Horned cattle are numerous, particularly in the northern districts. The bulls are generally tractable and are employed in the labors of the field — bullocks being little known. The sheep are supposed to number at least 45,000,000; while the goats are estimated at 10,000,000 or 12,000,000, and goat-skins constitute one of the principal articles of export.

Manufactures and Commerce.— In general among the rural population, each family supplies all its own wants. In the towns, however, some manufactures are carried on. Fez makes and exports great quantities of the cloth caps which bear the name of that city. The tanners of Mequinez and other places have a great reputation, and Morocco carpets are much esteemed in Europe. The commerce is partly carried on with the adjacent countries, partly with European states. From the Sudan are obtained ivory, gold-dust, ostrich feathers, asafœtida, gums, Guinea pepper and slaves. Of the whole of the commerce with Christian states nearly half is carried on with Great Britain. The exports consist of beans, peas, almonds, goatskins, eggs, wheat, wool, wax, etc.; the imports, of cottons, sugar, wine and flour. The French have constructed 1,500 kilometers of roads. A railway has been completed to Fez and another connecting Casablanca to Marakesh is under way, while a line to link up with the Algerian railways has been completed as far as Taza. Postal services have been introduced, there are several wireless stations, and in 1916 there were 4,185 miles of telegraph, exclusive of military lines. Imports (1915), about $54,900,000; exports, $12,834,000. The number of vessels entered at Moroccan ports in 1915 was 4,319, of a total tonnage of 1,963,540 tons.

Money, Weights and Measures.— Spanish dollars and pesetas, as well as Moorish coins minted for the Government in France are current, but of fluctuating value. The common currency consists of floos (two two-third cents) the blankeel or muzoona of siz floos equaling approximately 16 cents; the okia or ounce of four blankeels, about 64 cents, and the miktal of 10 ounces equaling 76 cents. The kintar of 100 rotals for native produce is equal to about 168 pounds; the kintar for imported articles about 112 pounds. The drak of eight tomins is equal to about 22 inches. The mudd dry measure by which grain is sold equals 1 17/60 bushels; the kula of 28 rotals, by which oil is sold wholesale, equals 47 pounds in weight, or 53 pints by measure.

Government.— The sovereign or Sultan of Morocco, styled by Europeans emperor, bears the title of Emir el Múmenin, or Lord of the True Believers. He is ordinarily called by his subjects simply *Seïd-na* — Our Lord. He is absolute in the strictest sense; the lives and properties of his subjects are at his disposal; from him alone proceed the laws, which he makes and unmakes at his pleasure. The imperial revenues are derived from imposts on property, from duties on imports and exports, from monopolies and from fines or confiscations. Under the sultanate régime every office was directly or indirectly purchased, small salaries or none were paid, the holders recouping themselves by plunder and oppression, tempered by the fact that at any moment they may be forced to disgorge to the Sultan, or in default be left to rot in the loathsome Moroccan dungeons, or be beaten or tortured to death. All justice was bought and sold. Yet, owing to the religious fanaticism of the people, and the mutual jealousies of the European powers, especially France, Great Britain, Germany, Italy and Spain, these unsatisfactory conditions were until recently preserved. See *post*, under *Government.*

Population.— For an estimate of the population of Morocco there are no certain data. One of the most recent calculations estimates it at 5,000,000. An important element of weakness in the social and political constitution is to be found in the several distinct races, which, so far from uniting, repel one another. The Berbers are the oldest inhabitants of the country, and they devote themselves to agriculture rather than to pastoral pursuits. The Arabs form the bulk of the rural population in the plains; some of them are cultivators, and some are Bedawí. In the towns along the coast are found the Moors, a people now physically distinct, whose origin as a distinct race cannot be satisfactorily explained. Their chief physical characteristic is their corpulence and they are more indolent and much less social than the Arabs. A considerable number of Jews is to be found in all the commercial towns of Morocco, where, in spite of the oppressions to which they are subjected, they often accumulate wealth, being the sole dealers in bullion and holders of capital. To these various ingredients of a checkered population must be added the negroes and their posterity of every shade, who are particularly numerous in the southern provinces. The civilization of Morocco had sunk to a low condition. The education given at the schools in the chief towns, and completed at the University of Fez, does not go beyond the theology of the Koran; but under French rule progress has been made. The public libraries, once famous, are now dispersed; true science is unknown, and whatever monuments of art are to be found in the kingdom point to the time when literature and art flourished under the Arababian dynasties in Spain. Music is the only art for which the Moors are said to manifest a decided taste, but they have not as yet arrived at any proficiency in it.

History.— In the Mauri of ancient writers it is easy to recognize the Moors of modern times. These people were supposed to have come from Asia, and particularly from Palestine, but their origin is doubtful. The Berbers are believed to be the representatives of the race that inhabited the country in the earliest historical times. After being for more than four centuries a part of the Roman empire, and in the later period of its sway veneered with a corrupt Christianity, «Mauritania Tingitana» fell (429 A.D.) into the hands of the Vandals, who introduced the piratical habits which afterward became so characteristic of the coasts of Barbary and Morocco. They held it till 533, when Belisarius having defeated them, it became subject once more to the Eastern empire. But in the latter part of the 7th century the Arabs spread over North Africa, and having taken possession of Mauritania, penetrated to the borders of the desert. About this time the Jews were expelled from Spain by decree of the Council of Toledo (694 A.D.), and sought refuge in great numbers on the shores of Africa. Near the close of the 8th century a Sherif or descendant of Mohammed named Edris obtained such an ascendency over the Berber tribes that they made him their sovereign, with the title of Imâm. His son and successor founded in 807 the city of Fez. In 1035 the warlike sect of the Morabites rose into existence on the borders of the desert. In 1055 their chief was proclaimed sovereign of Moghreb-el-aksa. His grandson and successor crossed the mountains and in 1072 laid the foundations of the city of Morocco, which thus arose with the remarkable dynasty of the Morabites. The expulsion of the Moors and Jews from Spain (1440–1501 A.D.) added 800,000 souls, it is said, to the population of Moghreb-el-aksa. In the middle of the 16th century a new dynasty commenced with the descendants of the Sherif Hosein. The fifth of this family, commonly called Hamed Sherif el-Mansú (1579–1603), made himself master of the whole of Moghreb-el-aksa, and pushed his conquests through the desert as far as Timbuktu and Kaghó. His reign is regarded as the golden age in the history of Morocco. The ninth and last Moroccan dynasty was that founded in 1648, by Mulai Sherif el Fileli, or King of Tafilelt. In 1814 the slavery of Christians was abolished and piracy was prohibited in 1817. Several complications arose with France, caused by the plundering of French vessels by pirates, but in each instance the emperor gave compensation. In 1859–60 there was a war with Spain, owing to attacks made by some of the wild tribes upon the Spanish territory; it resulted in a cession of land and an indemnity of $20,000,000 to Spain.

The Sultan Abdul Aziz IV succeeded his father El Hasan III, in 1894, when he was 14 years of age, and he had a difficult task with his turbulent people. On 18 May 1904, Rais-Uli, a prominent chieftain, captured and held for ransom, the Hon. Ion Perdicaris, an American subject, and his stepson Mr. Varley, an English subject. The ultimatum of the United States Secretary of State, John Hay, «Perdicaris alive or Rais-Uli dead,» a naval demonstration of American warships and representations from European courts, compelled the Sultan to comply with Hay's demands, and the captives were released. The Sultan's weakness became more and more apparent to the insurgent tribes of northern and central Morocco, and contempt for the rights of foreigners, with utter lawlessness prevailed throughout the kingdom. At the ports, especially Tangier, the property of Europeans, and even their lives, were in jeopardy. To safeguard the loan of $10,000,000 which had been advanced to the Sultan, the French government arranged for the appointment of a French financial adviser, with agents, to undertake the control of the Customs; it was also arranged to police Tangier with French-Algerians, and a French military mission proceeded to Fez. By the Anglo-French Agreement of 8 April 1904, France as the nation whose dominions bordered on Morocco, was to be unhindered by Great Britain in guarding the tranquility of that kingdom, in return for allowing Great Britain freedom of action in Egypt; moreover, freedom of trade was guaranteed for 30 years in Egypt and Morocco. In October 1904 a Franco-Spanish Agreement was also arranged, which recognized the terms of the Anglo-French Agreement, the maintenance of the territorial integrity of Morocco, the neutralization of the coast between Melilla and the Sebu River, the preponderating right of France to give the Sultan military, economic and financial assistance, and modified the limits of the Spanish sphere of influence. In January 1905 the reforms submitted by the French government were received with marked disfavor by the Sultan and by his Council of Notables. This was thought later to have been due to German diplomacy, which under the terms of the Madrid Convention of 1880, refused to recognize the agreements made by France with Great Britain and Spain concerning Morocco.

In 1880 the Madrid Convention with Morocco, bearing the signatures of Austria, Belgium, Denmark, Germany, France, Great Britain, Italy, Morocco, the Netherlands, Portugal, Spain, Sweden and Norway, and the United States, had established the right of protection in Morocco, and the 17th article of the treaty reads: «The right to the treatment of the most favored nation is recognized by Morocco, as belonging to all the Powers represented at the Madrid Conference.»

The German opposition was further emphasized by the visit of the German Emperor, William II to Tangier, 31 March 1905, when he assured the Sultan of his intention to uphold the integrity of the Moroccan kingdom and the equality of Germany's commercial and economic interests in the country. A special German mission was sent to Fez, and British and Spanish missions also proceeded to the Moorish capital, ostensibly to support the French policy. The Sultan and his advisers, 28 May 1905, refused to entertain the proposed reforms and advised an international conference of the Powers to deliberate on the Moroccan situation. After protracted negotiations between France and Germany, which were shadowed by rumors of probable war between the countries, and in which the resignation of M. Delcassé, the French Minister of Foreign Affairs, and the downfall of the Rouvier Ministry were incidents, a program was arranged to place before the International Conference. Algeciras in Spain, opposite Gibraltar, was chosen as the meeting place.

Various reasons were assigned for the unexpected raising of the Moroccan question by Germany; among these were — alarm at the apparent isolation of Germany in European politics, at the increase of French influence in North Africa, and at the consummation of an agreement which implied a further territorial division of Africa by private arrangement between two powers, regardless of German and other economic rights.

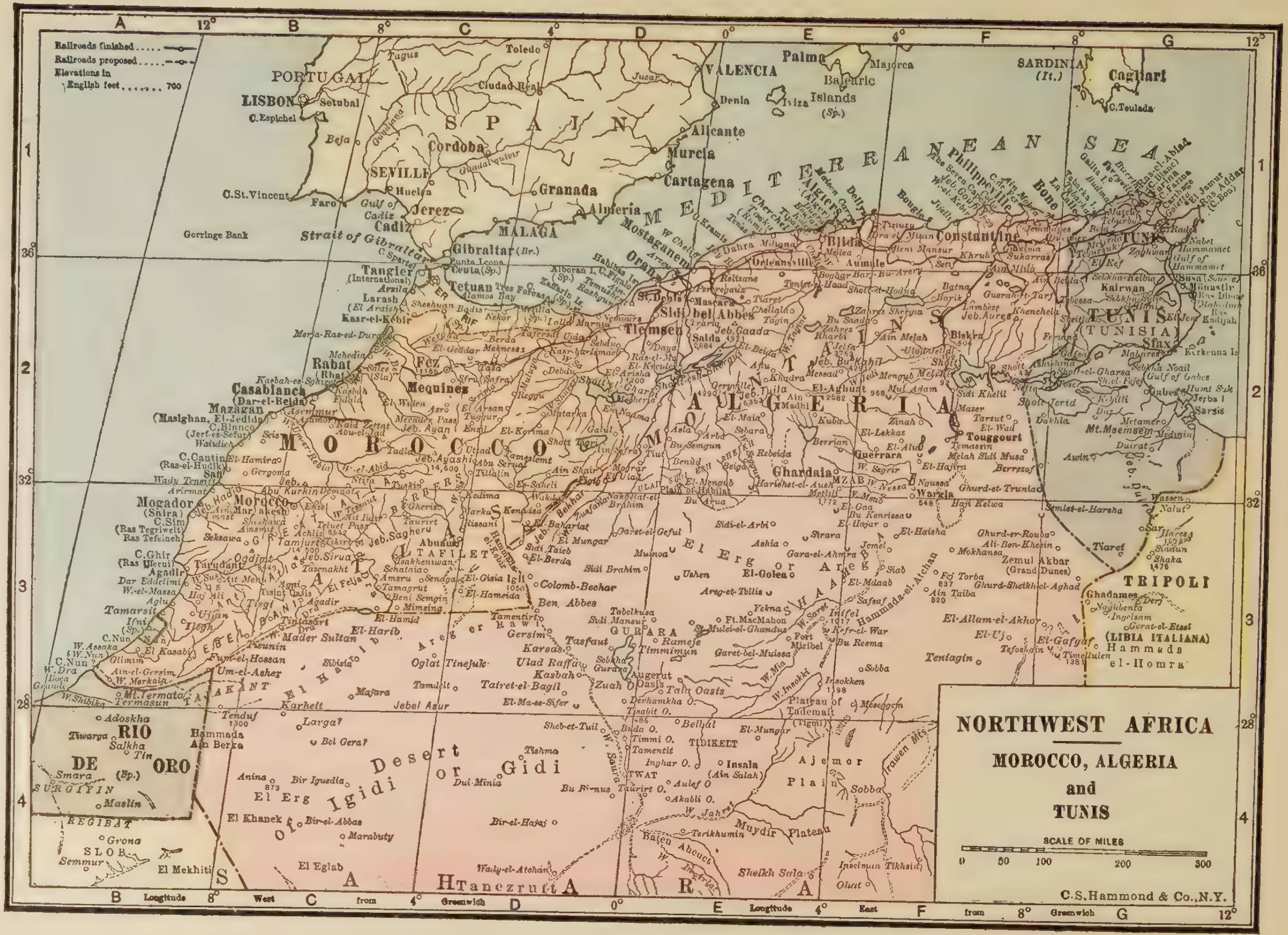
The various countries signatory to the Madrid Convention of 1880 sent delegates to Algeciras, and the conference was opened 16 Jan. 1906. The presence of the United States representatives was explained as safeguarding the nation's commercial interests in Morocco; with the political aspects of the conference, arising solely from the strained relations between Germany and France, wherein a *casus belli* might be found, the United States agents were specifically instructed not to participate. The meetings of the conference lasted until 31 March 1906, when after strenuous opposition and counter-proposals on the part of Germany, supported only by Austria, against the French program, supported by Great Britain, Russia, Italy, Spain, Portugal, the United States, Belgium and Holland, an agreement on all points was reached. The French program maintained that the police, under the Sultan's orders, should be commanded by French and Spanish officers and sub-officers nominated to the Sultan and appointed by him, and that the Inspector-General of the Police should report to the Sultan. Germany made a series of propositions in opposition to this general plan, seeking to bring the whole Moroccan business practically under the control of the European concert, requiring those Powers directly acting in Morocco to take a European mandate, and to be subject to the interposition of the other Powers, of which Germany would be an important one. Matters had almost reached a deadlock when a proposition relative to a mixed police force for the ports in dispute was brought forward by Ambassador White, under instruction from President Roosevelt, and introduced by the Russians, provided a solution for the existing difficulties. The division and the policing of the ports of Morocco was arranged as follows: Spain to police Tetuan and Larache; a Franco-Spanish mixed police to be established at Casablanca and Tangier, and a French police force alone to have charge of Mogador, Saffi, Mazagan and Rabat. The result of the conference was virtually a victory for France, which retained the preponderance of influence in the financial affairs of the kingdom, and lost little of what was demanded with regard to the policing of the country.

In 1907 Dr. Marchand was killed by natives at Marrakesh, and this was followed by French occupation of Udja, on the Algerian border. In 1908 Mulai Hafid succeeded to the throne. In 1909 — and again in 1911 — the Riffians made attacks on the Spaniards in the neighborhood of Melilla, which were ultimately defeated. In July 1911 the German government dispatched the cruiser *Panther* to Agadir in southern Morocco, where German financiers had acquired considerable concessions. The local chiefs were entertained on board the vessel and promised German support in any resistance they might make against French paramountcy in the country. The result was a threatened European conflagration: Great Britain assured France of her support, and for a time the situation was tense. Negotiations were entered into between France and Germany, which lasted for three months, and the result of which was the drawing up of two agreements (4 Nov. 1911), the one practically recognizing a French protectorate in the country but obtaining for German interests absolute equality in economic and commercial matters, with the cession to Germany of 250,000 square kilometres in the northern French Congo. In April 1912 the Sultan recognized the French protectorate, which has also been recognized by Great Britain, Germany and other great powers. General Lyautey was appointed resident general, with both civil and military powers. In that year Mulai Hafid abdicated in favor of Mulai Yusuf, the present Sultan. Spanish rights in the Spanish Northern Zone have been conceded, and it is administered by a Khalifa chosen by the Sultan. A zone in the district of Tangiers 140 square miles in extent, has been created.

After the outbreak of the Great War in August 1914 the French army of occupation, amounting to 85,000 men, was required elsewhere; it was decided to withdraw troops from the interior and to hold only the towns on the coast, and a mobile column was organized to keep order. Disturbances were created at the outset, inspired by German agents in the Spanish zone. About 30,000 Moors have fought in Europe, and thousands have filled places in munitions and other industries in France.

Bibliography.— Aflalo, M., ‹The Truth about Morocco› (London 1904); Bérard, V., ‹L'Affaire Morocco› (Paris 1906); Brives, A., ‹Voyages au Maroc› (Algiers 1909); Dawson, A. J., ‹Things Seen in Morocco› (London 1904); Desroches, G., ‹Le Maroc, son passé, son présent, son avenir› (Paris 1913); Doutté, E., ‹Missions au Moroc› (ib. 1914); Fraser, J. Foster, ‹The Land of Veiled Women› (London 1911); Holt, G. E., ‹Morocco the Piquant› (ib. 1914); Kerr, R., ‹Morocco after Twenty-five Years› (ib. 1912); Loti, Pierrè, ‹Morocco› (ib. 1914); Mackenzie, D., ‹The Khalifate of the West› (ib. 1911); Meaken, B., ‹The Moorish Empire› (ib. 1899); and ‹The Land of the Moors› (ib. 1901); Morel, E. D., ‹Morocco in Diplomacy› (ib. 1912); Playfair and Brown, ‹Bibliography of Morocco› (1892); Richet, E. E., ‹Voyages au Maroc› (Paris 1909); Spilsburg, A. G., ‹The Toumaline Expedition› (London 1906).

MOROCCO, or **MARRAKESH,** the second capital of the sultanate of Morocco (q.v.) on the north side of an extensive and fertile plain, 1,500 feet above sea-level, about 96 miles from Mogador, its port on the Atlantic, and 230 miles southwest of Fez, the chief capital of the empire. It has an excellent situation in sight of the Atlas Mountains, from which cool streams are always flowing and is noted for its genial and healthful climate. It commands the trade routes across the mountains, but the city has long been hastening to decay, chiefly the result of war, plague and wretched government. It is encircled by a lime and earth wall nearly six miles in circuit, between 20 and 30 feet high, with square towers every 50 paces, and pierced by nine gates, but all in a ruinous condition. A large portion of the immense space within the walls is occupied by ill-kept gardens, open areas, and «soks,» or market-places; the eight large cemeteries are outside the walls. In the bazaar and merchants' quarter a considerable local trade is carried on with the country people, the mountaineers from the neighboring Atlas, and with Sus, Tafilet, Mazagan, Saffi and Mogador. Morocco possesses many mosques, one of which, the Kutubia, has a tower after the model of the Hassan in Rabat and the Giralda in Seville, 320 feet high. On the south of the city stands the palace, now seldom occupied by the sultan, comprising a space of about 1,500 yards long by 600 yards wide, and near it is the Jews' quarter (El-Millah), a walled enclosure of about one and one-half miles in circuit, one-half of it nearly in


NORTHWEST AFRICA
MOROCCO, ALGERIA and TUNIS
SCALE OF MILES
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C.S.Hammond & Co.,N.Y.
Railroads finished
Railroads proposed
Elevations in English feet 700
Longitude West from Greenwich
Longitude East from Greenwich
A B C D E F G
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PORTUGAL
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C.Espichel
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Faro
Beja
Tagus
Toledo
Ciudad Real
SPAIN
Cordoba
SEVILLE
Huelva
Jerez
Cadiz
Gulf of Cadiz
Granada
MALAGA
Almeria
Cartagena
Murcia
Alicante
Denia
VALENCIA
Jucar
Palma
Majorca
Iviza
Balearic Islands (Sp.)
SARDINIA (It.)
Cagliari
C.Teulada
MEDITERRANEAN SEA
Gorringe Bank
Strait of Gibraltar
Gibraltar (Br.)
C.Spartel
Punta Leona
Ceuta (Sp.)
Tangier (International)
Arsila
Tetuan
Larash (El Araish)
Kasr-el-Kebir
Alboran I. (Sp.)
Melilla (Sp.)
Rif
Mersa-Ras-ed-Dur
Mehedia
Rabat (Rbat)
Salee (Sla)
Fez
Mequinez
Casablanca (Dar-el-Beida)
Mazagan
C.Blanco
Saffi
C.Cantin
Mogador (Suira)
C.Sim
C.Ghir
Agadir
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MOROCCO
Morocco
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TAFILET
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Ifni (Sp.)
C.Nun
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RIO DE ORO (Sp.)
Adoskha
Smara
Semmur
El Mekhiti
Desert or Gidi
El Erg Igidi
Hammada
Oran
Mostaganem
Arzeu
Tlemsen
Sidi bel Abbes
Saida
Tiaret
Orleansville
Cherchel
Algiers
Dellys
Blida
Aumale
Bougie
Setif
Constantine
Philippeville
Bone
La Calle
Batna
Biskra
Tebessa
Jeb. Aures
ALGERIA
Laghuat
Ghardaia
MZAB
Wargla
Touggourt
Querrara
El Golea
Colomb-Bechar
GURARA
TWAT
TIDIKELT
Insala (Ain Salah)
Plateau of Tademait
Ajemor Plain
Muydir Plateau
Tanezruft
SAHARA
Bizerta
TUNIS
Gulf of Hammamet
Susa
Monastir
Kairwan
TUNIS (TUNISIA)
Sfax
Kerkenna Is.
Gulf of Gabes
Gabes
Jerba I.
Shott Jerid
Mt. Msemsem
Ghadames
TRIPOLI (LIBIA ITALIANA)
Hammada el-Homra

ruins, thronged to suffocation and excessively filthy. There are several tanning and leather-dyeing establishments of considerable extent, though of late years European goods have been gradually displacing native manufactures. The population varies according to the presence or absence of the sultan, his court and army. Morocco was founded in 1072 by the Emir Yusef ben Tachefyn, and reached the summit of its prosperity in the 13th century and was famous as a seat of learning. In those days it is affirmed to have contained more than 700,000 inhabitants. During several centuries it suffered from civil wars, and was sacked by the rebellious Berbers more than once. Pop. estimated at from 50,000 to 80,000; Jews, according to one computation, totaling 17,000.

MOROCCO, or **MAROQUIN,** a fine kind of leather, prepared from the skin of the goat, originally brought from the Levant and the Barbary States, but now manufactured in most other countries. The colors most commonly communicated to it are red (by cochineal) and yellow (by the Avignon or yellow berries). Kano, in British Nigeria, is an important centre of production. Split calf and sheepskins are used in the production of good imitation (French morocco) for binding, the peculiar graining of the genuine article being imitated by machinery See also LEATHER.

MORÓN, mō'rôn, or **MORÓN DE FRONTÉRA,** Spain, town in the province of Seville, situated at the foot of the Sierra de Morón on the Guadira and on the Ultrera-Morón Railway. It contains the ruins of an ancient Moorish castle of great strength; the French destroyed it on their evacuation in 1811. The industrial resources are limited chiefly to the production of olive oil and its red hematite mines and marble quarries. Pop. 17,099.

MORONG, Thomas, American botanist: b. Cahaba, Ala., 1827; d. 1894. He went in boyhood to Massachusetts, and was graduated at Amherst College in 1848. After studying law he pursued a course in theology at Andover, leaving the seminary in 1853. He had early developed taste for botany, and in 1888 he began a voyage which led to valuable botanical collections made in explorations in Argentina, Chile and Paraguay. Returning in 1890, he became curator of the Columbia College herbarium. With N. L. Britton he published ‹An Enumeration of the Plants Collected by Dr. Thomas Morong in Paraguay, 1888–90.›

MÓRONG, mō'rŏng, Philippines, capital of the province of Rizal, Luzon, situated on the bay Lagoon (Laguna de Bay), 19 miles southeast of Manila Point.

MORONI, Giovanni Battista, jō-vän'nē bät-tes-tä mō-rō'nē, Italian painter: b. Bonda, near Albino, 1525; d. Bergamo, 5 Feb. 1578. He painted many altarpieces and historical compositions, some of which are to be found in the Brera Library at Milan, others in villages of the province of Bergamo. He was, however, most especially celebrated for his portraits which are lifelike and arrest the attention by their startling projection and lucid color tone. Many of them are to be met with in Italy. There are three examples in the Berlin Museum and five in the London National Gallery, amongst which is ‹The Tailor,› a masterpiece. There are also portraits in Boston, Philadelphia, Baltimore and the Metropolitan Museum, New York.

MOROS, mō'rōz, Mohammedan Malays inhabiting the southwestern part of the Philippines, chiefly the Sulu Archipelago and the islands of Palawan and Mindanao; various subdivisions include the Illanos, Samales, Joloanos, Maguendanaos, etc. Mohammedanism was propagated among the Moros in the 14th century by Malays from the island of Borneo, and is the prevailing religion. The Moro alphabet, which is still retained in writing, shows distinct traces of Arabic origin introduced by Arabic teachers of the doctrines of Islam. The Moros are governed by their local chiefs, dattos or sultans under a form of primitive feudalism.

They have no system of laws as such. The penal passages of the Koran, taken in connection with local customs, are referred to as the *Titab;* the local customs being mainly interpretations or even evasions of the Koran. Land is held in common, the dattos claiming sections as their own; in some localities, a «Master of the Field» allots plots of ground to individuals for permanent or temporary occupancy. Such real estate may not be alienated without permission having first been obtained from the authority granting residence thereon. Slavery and polygamy prevail among them; and they have for many years engaged in piracy and predatory expeditions against the neighboring Filipinos. They remained unconquered by the Spaniards until the era of modern firearms, and were still an inexhaustible source of trouble when the sovereignty of Spain terminated. Their religion and peculiar customs, as well as their spirit of independence, have made the government of their country one of the greatest problems of the United States occupation of the Philippines. The Sulu Archipelago in 1901 was placed under military supervision and government in accordance with a treaty made by the United States representative and the sultan of Sulu, who has relinquished his authority (see SULU). In 1903 a law was passed by the Philippine Commission providing government for the Moro country of Mindanao and adjacent islands. This act provides that the civil governor of the Philippine Islands shall appoint for the Moro Province a governor and other officials who were to form the legislative council, which was empowered to organize education, create a form of local government, establish courts and enact laws providing for the abolition of slavery and the suppression of all slave hunting and slave trade. The Moros were informed in 1900 that slaves who sought the protection of the United States garrison would be considered free and their freedom enforced. The datto at Zamboanga in 1901 abolished slavery among his followers. In 1903 the legislative council of the Moro Province passed a law prohibiting slave hunting in all the province, which law was immediately confirmed by the Philippine Commission. The order for disarmament of the Moros, made in September 1911, is being systematically carried out, but led in 1913 to a rebellion which was not quelled till they had been pursued and conquered in the mountain fastnesses of Bagsak in Northern Jolo. In 1914 the department of

Mindanao and Sulu was created. Pop. 154,706. See PHILIPPINE ISLANDS.

MOROSAURUS, a genus of sauropodous dinosaurs (q.v.), with an extremely long and flexible neck and small body; found fossil in the Upper Jura beds of Wyoming and Colorado. It was related to Brontosaurus.

MOROSINI, Andrea, än-drā'ä mō-rō-sē'nē, Venetian historian: b. Venice, 13 Feb. 1558; d. there, 29 June 1618. He was educated in belles-lettres at Padua, and from 1583 was in the service of the state. In 1600 he entered the senate, later was three times elected to the Council of Ten and in 1598 was made official historiographer of the republic to continue the work of Paolo Paruta. He was given access to the state papers as far as 1594. His 'History of Venice from 1521 to 1615, appeared in 1623 (2d ed., 1719), and has been esteemed for its accuracy and elegant Latinity.

MOROSINI, Francesco (called the PELOPONNESIAC), Venetian soldier: b. Venice, 1618; d. Napoli di Romagna, 6 Jan. 1694. He was a leading military commander of his day, and four times made generalissimo of Venetian forces. His career was almost a continuous struggle with the Turks. In 1656 he became governor of Candia, but in 1669 was compelled to surrender the island to Mehemet Koprili. His sobriquet was gained by later victories in the Morea. From 1688 he was doge of Venice. Daru ('Histoire de la République de Venise' 1819; 4th ed., 1853) calls him «the last of the Venetians.»

MORPETH, England, market town in the municipal borough of the same name in Northumberland County and located on the Wansbeck. It has two Anglican and one Catholic church, a town-hall (dedicated 1869), a large prison, ruins of a castle, etc. It has an iron foundry, brewery, tanneries, etc., and does considerable trade in grain. Nearby are the ruins of the Newminster Abbey, dating from 1138. The neighboring village of Mitford also has interesting ruins of a 12th century castle and Bothal Castle dating from the 14th century is on the northern bank of the Wansbeck. North of Morpeth is a 15th century «peel» tower. Its population in 1911 was 7,433.

MORPHEUS, môr'fūs, in classical mythology a minister of the god Sommus, sometimes called the god of sleep. He is generally represented as a slumbering child, of great corpulence, wearing wings, and holding a vase in one hand, and in the other some poppies.

MORPHINE, an alkaloid occurring in opium, and constituting from 3 to 20 per cent of the crude drug depending upon where it originated. It has the chemical formula $C_{17}H_{19}NO_3 + H_2O$. In the crude opium morphine exists in the form of two salts — the meconate and sulphate of morphia; and as both of these salts are soluble in water their recovery from the opium is of the simplest. In the preparation of morphine the opium is digested with water at 100° F., common chalk is added, and the solution is evaporated to a small bulk. Calcium chloride in slight excess is then added, to precipitate the meconic acid that the extract contains, and after filtration the solution is evaporated. Calcium meconate separates out first, after which crystals of the hydrochlorides of morphine and codeïne are deposited. The latter crystals are re-dissolved in water and decomposed with ammonia, the morphine with a little codeïne being thereby precipitated while most of the codeïne remains in solution. The codeïne is separated from the morphine by dissolving it with ether. Morphine dissolves in 10,000 parts of cold water, and in 500 parts of boiling water. It is also readily soluble in hot alcohol, but is insoluble in ether, benzene and chloroform. It is bitter and very poisonous, and crystallizes in small rhombic prisms, or needle-like crystals. Morphine acts as a base toward acids, and numerous salts of the alkaloid are known. In medicine, morphine is usually administered in the form of the sulphate or some other salt. When morphine is heated with hydrochloric acid in a closed tube, for two or three hours at a temperature of about 290° F. it loses a molecule of water and it becomes converted into another alkaloid which has the formula $C_{17}H_{17}NO_2$, and is known as «apomorphine.» Apomorphine is also poisonous. Its salts, when administered in small doses, however, do not act as a narcotic, but as a powerful emetic. Special attention has been paid, by chemists, to the positive identification of morphine, owing to the frequent importance of such identification in medical jurisprudence. The subject is full of technical difficulties, especially when (as is commonly the case) morphine, if present, is mingled with large quantities of animal tissue, from which it must be separated before the tests are applied. Many such tests are known, of which the following are the most familiar: (1) A neutral solution of a ferric salt, when added to a neutral solution of a morphine salt, gives a blue color which is destroyed by heat, by alcohol and by acids. (2) If iodic acid and starch are added to a weak solution of a morphine salt, and a weak solution of ammonia is floated upon the mixture, a brown ring below a blue ring will be formed at the bounding surface that separates the liquids from each other. Consult Autenrieth, W. (Warren's translation), 'Laboratory Manual for the Detection of Poisons and Powerful Drugs' (Philadelphia 1915).

MORPHOLOGY, the division of biological science which deals with the *form* of parts and organs of animals and plants, from Gr. *morphē*, form, and *logos*, doctrine, the term being equivalent to «science of form.» The investigation of the structure of living organisms is the only true method by which we may become acquainted with their relations to each other, singly or in groups. Morphology thus lies at the foundation of physiology, and all true systems of classification and explanations of serial development. Goethe was the inventor of the term and was the first to direct attention to relations in structure presented by living beings. See PLANTS, ANATOMY OF; PLANTS, MORPHOLOGICAL EVOLUTION OF.

MORPHY, môr'fĭ, **Paul Charles**, American chess-player: b. New Orleans, La., 22 June 1837; d. there, 10 July 1884. He showed his fondness for chess at a very early age, and at 12 had defeated many of the local amateurs. At the College of South Carolina he studied law for several years, occasionally playing a game. In 1857 at the first American chess congress held in New York, he had no difficulty in defeating his strongest opponents. During the next year, in England, he successfully met such players as Bird, Boden and Löwenthal, and astonished the world of chess by playing as many as eight games simultaneously and without the board. His playing in Paris, where he won five games out of eight against Harrwitz, and exhibited his blindfold skill, was equally surprising. In 1859 he returned to the United States and here met the famous German player Anderssen, winning 7 out of 11 games. Being now admitted to the bar, Morphy began to practise law in his native city; but his mental powers had been so impaired by the strain of his blind-fold chess-playing that he not only gave that up but relinquished chess entirely, and a little later abandoned all intellectual work. Morphy's skill at chess appeared to partake of the quality of genius. His brilliant achievements were not the result of long or deep deliberation, yet displayed all the elements usually observed when mental strength and quickness are sustained by profound study. Consult Löwenthal, 'Morphy's Games of Chess' (1860).

MORRELL, Imogene Robinson, American artist: b. Attleboro, Mass.; d. Philadelphia, 22 Nov. 1908. She was married to Abram Morrell in 1869. She studied art in the United States and Europe and was a pupil of Adolf Schrodter at Düsseldorf and of Couture at Paris (1864). In 1874 she returned to America, opened a studio at Washington as a portrait and historical painter, and there established and became first president of the Washington National Academy of Fine Arts (1879). Some of the more notable paintings are 'The First Battle of the Puritans'; 'Washington Welcoming the Puritan Trains at Newburgh, N. Y.'; 'Portrait of General John A. Dix.'

MORRILL, mŏr'ĭl, **Anson Peaslee,** American politician: b. Belgrade, Maine, 10 June 1803; d. Augusta, Maine, 4 July 1887. He at first engaged in business in his native town, then in 1833 was sent to the State legislature; was sheriff of Somerset County 1839–40, and in 1850 land agent. In 1853 he was an unsuccessful candidate for governor on the Prohibition and Free-Soil tickets, but the following year he was elected as the first Republican governor of Maine, and later was a delegate to the convention which nominated Frémont. In 1860 he was elected to Congress, but declined a re-election.

MORRILL, Justin Smith, American senator: b. Strafford, Vt., 14 April 1810; d. Washington, D. C., 28 Dec. 1898. He received a good primary and secondary education, was a merchant and then a farmer; was first elected to the House of Representatives in 1854. In 1867 was transferred to the Senate, in which he was long chairman of the committee of finance. With his 12 years in the lower house and 31 in the upper, he was more closely connected with Congress than any other man of his time, and was styled «The Father of the Senate.» His college bill of 1858, for the creation of seats of learning in newly-settled States, has, with supplemental legislation, resulted in the erection of some 70 colleges. He introduced the war revenue tariff of 1861, commonly called the Morrill tariff, and during his later years consistently opposed the remonetization of silver. Senator Morrill wrote 'The Self-Consciousness of Noted Persons' (1886). Consult G. W. Atherton, 'The Legislative Career of Justin S. Morrill' (Washington 1901).

MORRILL, Lot Myrick, American politician: b. Belgrade, Maine, 3 May 1813; d. Augusta, Maine, 10 Jan. 1883. He was educated at Waterville College (now Colby University), studied law and was admitted to the bar in 1839, when he went to Augusta and established a law practice. He took an active part in politics, in 1853 was elected to the legislature, and in 1856 was chosen president of the senate. He was governor of his State 1858–60, and in the latter year was elected to the United States Senate, where he proved himself an indefatigable worker. He favored the resumption of specie payment and was an authority on financial, naval and Indian affairs. In 1876 he retired from the Senate to become Secretary of the Treasury under President Grant, and during his administration of that office constantly urged the return to specie payment. He declined an appointment to a foreign mission under President Hayes, and in 1887 became collector of customs at Portland, Maine, in which office he died.

MORRILLTON, Ark., capital town of the county of Conway, 50 miles by rail from Little Rock. It has manufactures of cottonseed oil, furniture, woolens, lumber, etc., and has a fair trade in cotton and cattle. The town owns its electric light and waterworks, and in 1920 had a population of 3,010.

MORRIS, Benjamin Wistar, American Protestant Episcopal bishop: b. Wellsborough, Pa., 30 May 1819; d. Portland, Ore., 8 April 1906. He was graduated from the General Theological Seminary in 1846 and held successive rectorates in Sunbury, Manayunk and Germantown, Pa. He was consecrated missionary bishop of Oregon and Washington in December 1868, and on the division of the diocese in 1880, became bishop of Oregon. He has published 'Presbyterian, Baptist and Methodist Testimony to Confirmation' (1860).

MORRIS, Charles, English song writer: b. 1745; d. near Dorking, Surrey, 11 July 1838. In 1764 he entered the 17th foot, with which he served in America, later exchanged into the Irish Dragoons and then into the 2d life-guards, in 1785 was made bard of the Beefsteak Society, and before its gatherings sang many of his wittiest efforts. He was a boon companion and associate of Fox and the Prince Regent. His humor and vivacity led Curran to say, «Die when you will, Charles, you will die in your youth.» He wrote hundreds of songs, many being political ditties for the Whigs; and a posthumous volume, 'Lyra Urbanica' (1840) collected them. His 'A Reason Fair to Fill my Glass' was praised by Moore and set to music by Charles Dibdin.

MORRIS, Charles, American naval officer: b. Woodstock, Conn., 26 July 1784; d. 27 Jan. 1856. Entering the navy in 1799, he participated in the war with Tripoli, was an actor in the recapture of the *Philadelphia,* in the harbor of Tripoli (1804), being the first to gain her deck when she was boarded. At the outbreak of the War of 1812 he was serving as executive officer of the *Constitution;* he was wounded in the engagement of *Old Ironsides* with the *Guerrière* (August 1812); and afterward successfully commanded the *John Adams* until, being blockaded by a British squadron in Penobscot River, he was compelled to destroy his ship to save her from being taken by the enemy. In the war with Algiers (1815) he commanded the *Congress,* and it was he who, in the *Brandywine,* carried Lafayette home to France (1825). After serving for some years as naval commissioner and as supervisor of the United States Naval Academy he became chief of the bureau of ordnance and hydrography, which position he held till the time of his death. Consult his ‘Autobiography’ (1880).

MORRIS, Charles, American author: b. Chester, Pa., 1 Oct. 1833. He was educated in Chester, engaged for a short period in teaching; for a considerable time was manager in a manufacturing concern; and since 1878 has devoted himself to literary work. His publications include ‘A Manual of Classical Literature’; ‘The Aryan Race’; ‘Civilization, an Historical Review of its Elements’; ‘Historical Tales’ (12 vols.); ‘The War with Spain’; ‘Our Island Empire’; ‘Man and his Ancestor’; ‘Famous Men and Great Events of the Nineteenth Century’; ‘Home Life in All Lands’; a series of histories of the United States; ‘History of the World’ and ‘History of Pennsylvania,’ for school purposes; ‘The Old South and the New’; ‘The Story of Mexico’; ‘Heroes of America’ (4 vols.); ‘The Nations of Europe’; ‘Famous Days and Deeds in Belgium and Holland,’ and various others. He also compiled ‘Half Hours with the Best Authors’ (18 vols.); ‘Elocution, Oratory and Entertainment’ (4 vols.); ‘The Famous Orators of the World’; ‘Handy Dictionary of Biography,’ etc. He edited ‘Winston's Universal Dictionary’; ‘The International Dictionary’; ‘Winston's Cumulative Encyclopedia’; and did editorial work on ‘Lippincott's Biographical Dictionary,’ and ‘Chambers’; ‘Twentieth Century,’ and other encyclopedias.

MORRIS, Clara, American actress: b. Toronto, Canada, 1849. After early study in Cleveland, she became leading lady in Wood's Theatre, Cincinnati, Ohio, and in the winter of 1869–70 joined Augustin Daly's Fifth Avenue Company, New York. She at once achieved success in emotional rôles and afterward made many tours throughout the United States. Her leading rôles include ‘Camille’; Alixe in the ‘Countess de Sommerive’; ‘Mercy Merrick’; ‘Miss Multon’; ‘Lady Macbeth’; ‘Leah the Forsaken’; and Cora in ‘L'Article 47.’ After her retirement from the stage she wrote much for periodicals and published in book-form ‘A Silent Singer’ (1899); ‘My Little Jim Crow’ (1900); ‘A Pasteboard Crown,’ fiction (1902); ‘Stage Confidences’ (1902); ‘The Trouble Woman’ (1904); ‘The Life of a Star’ (1906); ‘Left in Charge’ (1907); ‘New East Lynne’ (1908); ‘Dressing Room Receptions’ (1911). She was married to F. C. Harriott in 1874. In her later years she was afflicted with blindness.

MORRIS, Sir Daniel, British colonial expert: b. Loughor, Glamorgan, 26 May 1844. He was educated at Cheltenham, at the South Kensington Royal College of Science and at Trinity College, Dublin, where he received high honors. He was assistant director of the Royal Botanic Gardens of Ceylon in 1877; investigated and checked the coffee-leaf disease; became director of the Botanic Department of Jamaica in 1879; was commissioner in the West Indian Imperial Department 1898–1908; a member of the Canadian and West Indian Trade Commission 1909–10; and was scientific adviser in tropical agriculture to the Colonial Office 1908–13. He was created K.C.M.G. in 1903. Among his publications are ‘Cacao: How to Grow and How to Cure it’ (1882); ‘Agricultural Resources of Saint Helena’ (1884); ‘The Vegetable Resources of the West Indies’ (1888); ‘Sisal Industry of the Bahamas’ (1896); and ‘Cantor Lectures on Plants yielding Indiarubber’ (1898).

MORRIS, Edward Joy, American author: b. Philadelphia, Pa., 16 July 1815; d. there, 31 Dec. 1881. He was graduated from Harvard in 1836 and was admitted to the bar in 1842. He was a member of the Pennsylvania legislature in 1841–43 and of Congress in 1843–45, and in 1850 was appointed to a mission in Naples where he remained four years. He was again in Congress as a representative of Pennsylvania in 1858–61, and from 1861–70 was Minister to Turkey. He published ‘Notes of a Tour through Turkey’ (1842) and numerous translations.

MORRIS, Edward Parmelee, American Latinist, best known as a Plautine scholar: b. Auburn, N. Y., 1853. He was graduated at Yale in 1874, studied at Leipzig and Jena, was professor of Latin at Williams 1885–91, and since the latter date at Yale, and edited the following plays of Plautus: ‘Mostellaria,’ ‘Pseudolus’ (1890), and ‘Captives and Trinummus’ (1898); Horace's ‘Satires’ (1909) and ‘Epistles’ (1911); ‘Sentence-Questions in Plautus and Terence’; ‘The Subjunctive in Plautus’ and ‘Principles and Methods in Syntax’ (1902).

MORRIS, George Perry, American journalist: b. Montclair, N. J., 18 Feb. 1864. He was educated at Rutgers College and Johns Hopkins University, and in 1891 was associate editor of the Boston *Congregationalist.* In 1888–90 he was on the editorial staff of the New York *Mail and Express,* on the Boston *Congregationalist* in 1891–1907 and on the staff of the Boston *Herald* 1907–11. Since 1911 he has been on the staff of the *Christian Science Monitor.* He has published ‘The Norwegian Company System’ (1894); ‘Historic Towns of New England’ (1898). He is a contributor to various magazines, especially character studies of living notables in *Review of Reviews.*

MORRIS, George Pope, American journalist and poet: b. Philadelphia, 10 Oct. 1802; d. New York, 6 July 1864. With Samuel Woodworth (q.v.), in 1823, he founded the New York *Mirror,* a weekly journal of literature, afterward published as the *New Mirror* and the *Evening Mirror,* in which many of the early writings of Bryant, Poe, Halleck, Willis and other American authors first appeared. In 1845 Morris established the *National Press,* which in the following year became the *Home Journal,* and which, with the assistance of N. P. Willis (q.v.), he continued to edit almost to the end of his life. He wrote ‹Briarcliff,› a popular drama (1825) and edited ‹American Melodies› and (with Willis) ‹The Prose and Poetry of America› (1845). His ‹Poems› (final collection, 1860) included «Woodman, Spare that Tree»; «A Long Time Ago»; «My Mother's Bible»; and other well-known pieces.

MORRIS, George Upham, American naval officer: b. Massachusetts, 3 June 1830; d. Jordan Alum Springs, Va., 15 Aug. 1875. He was appointed midshipman in the navy in 1846 and received steady promotion. In 1862 he was made lieutenant-commander and assigned to the *Cumberland,* and was in temporary command of her when she was attacked by the *Merrimac* in Hampton Roads. The gallant seamanship displayed by Morris on this occasion evoked the admiration of the country. He refused to leave the ship and stood at his post as she went down, but was rescued by some of his men. He afterward had command of the gunboat *Port Royal* and was engaged on the James River, at Fort Darling, and later at Fort Powell and at Grant's Pass. He was promoted commander in 1866 and retired in ill-health in 1874.

MORRIS, Gouverneur, American statesman: b. Morrisania, N. Y., 31 Jan. 1752; d. there, 6 Nov. 1816. He was graduated in 1768 from King's College (now Columbia University); after study of the law was licensed in 1771 to practise as an attorney; did excellently well at the bar; and during the earlier difficulties between Great Britain and the American colonies maintained a conservative attitude and was eager to effect a compromise. Finally, however, he identified himself with the patriot cause and was elected from Westchester County to the provincial congress of New York (1775). In this assembly he became the leader of the patriotic party and made an able speech favoring the adoption of the recommendation of the Continental Congress that the colonies establish new governments. A delegate to the constitutional convention of New York, he was chosen to the committees for drafting a plan for the constitution — in which Livingston and Jay were also prominent — and for establishing a State fund. In 1777–80 he was a member of the Continental Congress, and almost immediately upon taking his seat was appointed one of a committee of five to visit Valley Forge and examine the condition of the troops. Early in 1779 he was made chairman of the important committee for receiving communications from our ministers abroad, and from the envoy of France. In this capacity he drew up the draft of instructions to the ministers which was adopted by Congress and formed the basis of the Treaty of Peace with Great Britain. In February 1780 he began the publication in the *Pennsylvania Packet* of a series of essays on American finances, in which he endeavored to show the wisdom of the colonists submitting to a reasonable taxation and outlined a scheme for such assessment. These essays influenced his appointment in 1781 as assistant financier to Robert Morris, a post he successfully filled until 1785. He was really the founder of the national coinage, though his plan was later modified by Jefferson and Hamilton; he introduced the decimal notation and devised the word «cent» to indicate one of the lesser coins. In 1787 he was a delegate to the constitutional convention, and there he advocated a strongly centralized government, and finally revised the draft of the instrument. He was in France in 1788–91 for the transaction of private business, witnessing the stirring events of the French Revolution, and of which he kept a diary, and in 1791 was appointed by Washington a confidential agent to treat with Great Britain regarding certain unfulfilled articles of the treaty of peace. In 1792–94 he was minister to France, and in 1800–03 was United States Senator, filling a vacancy. He supported the Louisiana Purchase, but opposed the abolition of direct taxes and of the judiciary system. In 1810–13 he was chairman of the Erie canal commission; in the entire plan for this waterway, which he wished to make large enough for ships, he was a leader. He was keen in intellect, an excellent orator and rendered notable services to America. During the War of 1812 his ultra-Federalist views led him into positions that were extravagant and unwise. He pronounced funeral orations on Washington, Hamilton and Clinton; published pamphlets and addresses; and latterly contributed to newspapers political satires in both prose and verse. Consult Sparks, ‹Life› (1832); Roosevelt, ‹Life› (1888: ‹American Statesmen› series); Morris, A. C., ‹Diary and Letters of Gouverneur Morris› (1888).

MORRIS, Gouverneur, American novelist, great-grandson of the preceding: b. New York, 7 Feb. 1876. He was graduated from Yale in 1898 and has published ‹A Bunch of Grapes› (1897); ‹Tom Beauling› (1901); ‹Aladdin O'Brien› (1902); ‹The Pagan's Progress› (1904); ‹The Footprint and Other Stories› (1908); ‹Putting on the Screws› (1909); ‹Spread Eagle, and Other Stories› (1910); ‹The Voice in the Rice› (1910); ‹It and Other Stories› (1912); ‹If You Touch Them They Vanish› (1913); ‹The Incandescent Lily and Other Stories› (1914); ‹Seven Darlings›; ‹When My Ship Comes In› (1915); ‹We Three› (1916).

MORRIS, Harrison Smith, American author: b. Philadelphia, 4 Oct. 1856. He was educated in the public and private schools, and early began to do literary work. From January 1899 to 1905 he was editor of *Lippincott's Magazine.* He is versed in the history of art, and was managing director of the Pennsylvania Academy of Fine Arts, in Philadelphia, from 1893 to 1905. He has written ‹A Duet in Lyrics,› poems, with J. A. Henry (1883); ‹Tales from Ten Poets› (1893); ‹Madonna and Other Poems› (1894); a continuation of Lamb's ‹Tales from Shakespeare› (1893); ‹Lyrics and Landscapes› (1908); a ‹Life of William T. Richards› (1912) and has edited ‹In the Yule Log Glow› (1892) and ‹Where Meadows Meet the Sea› (1892). He was president of Wharton Steel Company (1909–17), and has been chairman of the committee on ways and means of the National Academy of Design, New York; was commissioner general of the United States of America to Roman Exposition of 1911 and decorated with Grand Cordon of Crown of Italy. He is a member and former vice-president of the National Institute of Arts and Letters; member of the American Philosophical Society and in 1915 became president Contemporary Club, Philadelphia.

MORRIS, Sir Henry, English physician: b. Petworth, Sussex, 7 Jan. 1844. He was educated at Epsom College and University College and studied medicine and surgery at Guy's Hospital, London. Established in practice, he delivered the Cavendish lecture (1893), Hunterain lectures (1898) and was Bradshaw lecturer at the Royal College of Surgeons (1903), since which he has distinguished himself frequently on the lecture platform. He was former surgeon and lecturer in anatomy and surgery at Middlesex Hospital Medical College, examiner in surgery at University of London and in anatomy at University of Durham. He was for six years chairman of the Court of Examiners of Royal College of Surgeons, president of the Royal Society of Medicine (1910–12) and Royal College of Surgeons (1906–09). He was created baronet 1909. Among his literary works are 'Anatomy of the Joints of Man' (1879); Surgical Diseases of the Kidney and Ureter' (1885); 'Gynecology' (1891); 'Injuries and Disease of the Genital and Urinary Organs' (1895); 'Treatise on Human Anatomy' (1898; 4th ed., 1907). His 'Treatment of Inoperable Cancer' (1902) and 'Suggestion in Relation to the Treatment of Disease' (1910); 'Looking Back; Christian Science Refuted' (1909), all contributed to his reputation.

MORRIS, Henry W., American naval officer: b. New York, 1806; d. there, 14 Aug. 1863. He entered the navy in 1819 and in 1828 was made lieutenant. He was on duty in New York and various other stations from 1839 until 1855, when he was fleet-captain in the Mediterranean under Commodore Stringham. In 1861 he superintended the completion of the *Pensacola,* and in 1862 took command of her, successfully passed the Confederate fortifications on the Potomac and took a distinguished part in the battles at Fort Jackson, Fort Saint Philip and Chalmette. He guarded New Orleans after its capture, but failing health necessitated his return to the North, where he soon after died. He was promoted commodore in 1862.

MORRIS, John, English Jesuit: b. Ootacamund, India, 1826; d. 1893. He studied (1845) at Trinity College, Cambridge, became (1846) a Roman Catholic, was ordained (1849) to the English mission, and became vice-rector of the English College, Rome (1852–55). Returning to England he was appointed secretary to Cardinal Wiseman and to his successor Cardinal Manning. He entered the Society of Jesus in 1867, was rector of Saint Ignatius College, Malta (1877–78), was made professor of canon law and church history at Saint Bruno's College, Saint Asaph (1879) and was rector at Rohampton 1880–86. He wrote 'Condition of Catholics under James' (1871); 'The Troubles of our Catholic Forefathers' (1875); 'Cardinal Wiseman's Last Illness' (1871); 'Life and Martyrdom of Saint Thomas Becket' (2d ed. 1885). Consult Pallen, J. H., 'Life and Letters of Father John Morris' (London 1896).

MORRIS, John Gottlieb, American Lutheran clergyman: b. New York, 14 Nov. 1803; d. Lutherville, Md., 10 Oct. 1895. He was graduated from Dickenson College in 1823 and studied theology at the Princeton and Gettysburg seminaries, receiving his license to preach in 1826. He founded the first English Lutheran church of Baltimore and was in charge of it from 1827–60, after which he held various important charges. He was chiefly instrumental in the founding of the College for Women in Lutherville and of the town. From 1834 until his death he was lecturer at Pennsylvania College, and he also lectured in the Smithsonian Institution at Washington. He was prominently connected with scientific and religious societies, and founded the *Lutheran Observer* in 1831 which he edited until 1833. He was librarian of the Peabody Institute at Baltimore, 1860–64. Among his many publications are 'Catechumen's and Communicant's Companion' (1831); 'Life of John Arndt' (1853); 'Fifty Years in the Lutheran Ministry' (1878); 'Memoirs of the Stork Family' (1886), etc.

MORRIS, Lewis, American statesman: b. New York, 1671; d. Kingsbury, N. J., 21 May 1746. He practised law in New York, was judge of the Superior Court of New York and New Jersey in 1692, became one of the governor's council and a member of the assembly, and drew up and presented to Queen Anne the complaint against Governor Cornbury formulated by the assembly. From 1710–38 he was chief-justice of New York and New Jersey, in 1731 was acting governor of New Jersey, in 1738 was prominent in effecting the separation of New Jersey from New York, and from 1738 until his death was governor of New Jersey.

MORRIS, Lewis, American patriot, one of the signers of the Declaration of Independence: b. Morrisania, Westchester County, N. Y., 1726; d. there, 22 Jan. 1798. After being graduated at Yale College in 1746 he engaged in farming on a very extensive scale on his paternal estate at Morrisania. He took strong ground against the act of Parliament compelling the inhabitants of the province of New York to furnish with supplies the foreign troops quartered upon them. He was elected to the Congress of 1775, was a member of the committee to devise means for supplying the colonies with munitions of war, and after the close of the session was sent west to detach the Indians from the British. In 1776 he resumed his seat in Congress, and signed the Declaration of Independence, although his estate was at that time in the hands of the enemy. As a consequence his manor was laid waste and his family expelled. In 1777 he was succeeded in Congress by Gouverneur Morris, his half brother, but afterward served in the State legislature. The latter part of his life was spent at Morrisania. He was one of the boldest and most zealous promoters of the Revolution.

MORRIS, Sir Lewis, Welsh poet: b. Carmarthen, Wales, 23 Jan. 1833; d. London, England, 12 Nov. 1907. He was graduated from Jesus College at Oxford, studied law and was admitted to the bar of Lincoln's Inn in 1861, practising until 1881. Was deputy chancellor of University of Wales and prominently associated with the cause of education. In 1895 he was knighted. His verse was fluent, the utterance of simple truths in unaffected language, and it was very popular, but deficient in strength, his 'Epic of Hades' (1876–77) going through many editions. Other volumes of his verse are 'Songs of Two Worlds' (1871–75); 'Gwen: a Drama in Monologue' (1879); 'The Ode of Life' (1880); 'Songs Unsung' (1883);

'A Vision of Saints' (1890); 'Harvest Tide' (1901); 'The Life and Death of Leo the Armenian' (1904); 'The New Rambler: From Desk to Platform' (1905), etc.

MORRIS, Mary Philipse, American Tory: b. Philipse Manor, New York, 1736; d. York, England, 1825. She was one of the famous Philipse family, daughter of the second lord of the Manor, Frederick Philipse. A beautiful brunette, she is the original of Cooper's heroine in 'The Spy,' and was long said to be one of George Washington's loves; but the story that she rejected him is untrue. Two years after meeting Washington she married George Morris (1758), an English officer, with whom she lived in what was afterward Washington's headquarters and the Jumel house. Her property was confiscated at the opening of the Revolution and she went to England. Her surviving children, being free from attaint according to the ruling of the English Attorney-General, sold their rights to John Jacob Astor for $100,000, and the British government paid them more for their losses.

MORRIS, Robert, American financier and statesman, a signer of the Declaration of Independence: b. Liverpool, England, 31 Jan. 1734; d. Philadelphia, 8 May 1806. He came to the colonies about 1747 and entered at Philadelphia the counting-room of Charles Willing, merchant; in 1754 formed a partnership with Thomas Willing maintained until 1793; acquired a very considerable fortune for the America of that time; and despite his strong loyalty to England, opposed the Stamp Act and signed the non-importation agreement of 1765. In October 1775 he was elected to the provincial assembly, and in 1776–78 was a member of the Continental Congress. On 2 July 1776 he voted against the Declaration of Independence and on 4 July absented himself; but on 2 August he was one of the signers. When hostilities began his services became of increasing value. When Congress fled from Philadelphia to Baltimore on 12 Dec. 1776, Morris was left in charge of its affairs, and when it reassembled at Baltimore on 20 December was made with George Clymer of Pennsylvania and George Walton of Georgia a committee for the execution of Continental business. Morris did all that was done. Most of the business of the colonies during December and January was transacted by him; he prepared American ships for sea, assumed charge of incoming freights and supplied Washington with money. On 20 Feb. 1781 he was elected superintendent of finance. He found the treasury in a disordered state through a vastly depreciated paper currency, and at the lowest point in the fortunes of the Continental army borrowed money on his own credit and was the instrument in the difficult task of financing the war. He presented to Congress a plan for the organization of the Bank of North America, accepted 28 May; and himself subscribing $39,200 worth of shares. The bank was incorporated 31 Dec. 1781 and began operation 7 Jan. 1782. Morris resigned January 1783, but on request did not retire until 1 Nov. 1784. He was a member of the Pennsylvania assembly in 1776–78, 1778–79, 1780–81, 1785–87. In 1787 he was a member of the convention that framed the United States Constitution. He declined the Secretaryship of the Treasury, and was United States Senator from Pennslyvania in 1789–95. With James Greenleaf and against Washington's advice, he entered land speculation, held vast territories, especially in the western half of New York State in anticipation of immigration after the war, and purchased in the new city of Washington 6,000 lots at $80 each, and agreeing to build yearly 20 brick houses. Largely through the defaulting of his partner he was compelled to make an assignment, and was imprisoned for debt at Philadelphia from 19 Feb. 1798 to 26 Aug. 1801. The influence of his credit, his ability in raising loans and his financial skill were of the utmost importance to the struggling cause of the Revolution; and it is generally admitted that he was a momentous force in Washington's administration and fully earned the title of the «Financier of the Revolution.» Consult Sparks, 'Diplomatical Correspondence of the Revolution' (1829–30); the 'Life' by Sumner (1892) in the 'Makers of America' series; Rolles, 'Financial Administration of Robert Morris' (1878), and Oberholtzer, 'Robert Morris: Patriot and Financier' (1903).

MORRIS, Thomas, American statesman: b. Augusta County, Va., 3 Jan. 1776; d. Bethel, Ohio, 7 Dec. 1844. He removed in 1795 to Columbia, Ohio, and was employed by the Rev. John Smith, the first senator from Ohio. He fixed his residence in 1800 in Clermont County, studied law, was admitted to the bar, was a member of the State legislature from 1806 to 1830, was a judge of the State Supreme Court (1815–21), and in 1832 was elected to the United States Senate as a Democrat, where he distinguished himself as an opponent of slavery and was engaged in important debates with Calhoun and Clay in defense of the right of petition and of the duty of the general government to discourage slavery. His anti-slavery sentiments rendered him distasteful to the Democratic party, by which he had been elected, and he permanently retired in March 1839. In 1844 he was nominated for Vice-President by the Buffalo convention of the Liberty party, on the ticket with J. G. Birney (q.v.) for President. Consult the 'Life' by F. B. Morris (1856).

MORRIS, William, English poet and artist: b. Walthamstow, Essex, 24 March 1834; d. Hammersmith, London, 3 Oct. 1896. He was educated at Marlborough College and Exeter College, Oxford, where he began a lifelong friendship with Edward Burine-Jones. Both were attracted by the Anglo-Catholic revival, and intended to enter the Anglican priesthood, but early abandoned that resolve, and was for some nine months a pupil in the office of the noted architect, George Edmund Street. In 1856 he founded *The Oxford and Cambridge Magazine,* to which he contributed often, and which he published at his own expense for the year it was issued. Two years later (1858) appeared 'The Defense of Guinevere and Other Poems,' in the pages of which the temper of the Middle Ages may be said to find its most accurate modern interpretation. In 1867 he published the 'Life and Death of Jason,' an epic of 17 cantos in heroic couplets, which showed him to be a teller of stories *par excellence.* By this time he had definitely entered upon his career of weaver anew of old tales from classic or mediæval sources, and the next year (1868) appeared the first volume of 'The Earthly Paradise,' a series of stories retold from classical and mediæval originals, but with a mediæval setting. A second and third volume followed in 1869 and 1870, the entire work comprising 24 tales with the addition of interludes and preludes and 12 lyrics of the months. In 'The Earthly Paradise,' as in the 'Jason,' Morris took Chaucer for his master as well in the structure of his verse as in what may be termed the processional nature of his descriptive passages. Three verse forms are employed by him, the seven-lined decasyllabic stanza known as the Chaucerian heptastich, the four-foot couplet and the heroic couplet. 'The Earthly Paradise' includes some 40,000 lines, but when once the reader has fallen under the poet's sway his leisurely manner will not be found wearisome. In 'The Lovers of Gudrun,' one of the tales of 'The Earthly Paradise,' Morris had already turned to Iceland for a theme and in 'The Story of Sigurd the Volsung and the Fall of the Niblungs' (1876) he returned to Icelandic myth for his subject. The poet regarded this poem as his masterpiece and in the opinion of not a few critics it ranks as almost the greatest, if not the greatest epic of the 19th century. In his hands the ancient myth becomes alive and throbs with all the intensity of primeval passion. Besides these works Morris published also in verse 'Love is Enough, or the Freeing of Pharamond' (1872); 'The Æneids of Virgil done into English verse' (1875), in which the metre adopted is that of Chapman's Homer; 'The Odyssey of Homer done into English verse' (1887); 'The Dream of John Ball' (1888), and 'Poems by the Way' (1892).

In 1859 Morris married Miss Jane Burden. In 1861 he founded the firm of Morris, Marshall, Faulkner and Company and began the manufacture of wall-paper, stained glass and artistic furniture, and to his labors in this particular is traceable much of the reform which English and American trade has experienced in household art during the last generation. In 1890 he established the Kelmscott Press at Hammersmith, and there published exquisitely printed editions of Chaucer, Beowulf and other works, as well as of his own writings. Still another side of his nature was shown in the trend of his human sympathies. He had long been known as poet and craftsman, but from 1885 he was active as a social reformer, lecturing frequently to workingmen in halls or in the open air, and helping to support the *Commonwealth,* a Socialist journal. It is not wholly easy to understand this side of his nature, for intensely democratic as he became, in theory at least, he was an equally intense lover of that very beauty which a social upheaval would destroy. The ugliness of much of modern life led him to Socialism, but he was thoroughly sincere in his attitude, illogical as it may seem to many. However difficult it may be to adjust satisfactorily to our minds the attitude of the poet-Socialist with the character of his work as a craftsman, which was offered to the world at prices practically prohibitory for the majority of persons, it is an unquestionable fact that the world is a pleasanter, wholesomer world for his having lived in it. He helped his generation to perceive that there is no necessary alliance between utility and ugliness; he raised the standard of household taste, and as a poet he was one of the most melodious of his time. In his later years he essayed a form of composition in mingled prose and verse greatly enjoyed by many, though perhaps not wholly to the taste of those who liked him best as the author of 'The Earthly Paradise' and 'Sigurd'— a series of romances beginning with 'The Tale of the House of the Wolfings' (1889), and succeeded by 'The Roots of the Mountains' (1890); 'News from Nowhere' (1891); 'The Story of the Glittering Plain' (1891); 'The Wood beyond the World' (1894); 'The Well at the World's End' (1896); 'The Water of the Wondrous Isles' (1897), and 'The Story of the Sundering Flood' (1898). With Erikir Magnusson, the Icelandic scholar, he published 'The Story of Grettir the Strong' (1869); 'Volsunga Saga' (1870), and 'Three Northern Love Stories and Other Tales' (1875). Still other works by him are 'The Decorative Art' (1878); 'Hopes and Fears for Art' (1882); 'Signs of Change' (7 lectures, 1888); with Belfast Bax, 'Socialism: Its Growth and Outcome' (1893); 'Architecture, Industry and Wealth' (1903). Morris received a tentative offer of the laureateship on the death of Tennyson, but his socialistic theories would have suited ill with the post, and he indicated that it would not be acceptable to him. He was a devoted admirer of mediæval architecture, and his account in the 'Earthly Paradise' of the front of Peterborough cathedral is one of the finest descriptions of an architectural feature to be found in English literature. He wrote the excellent monograph on 'Mural Painting' in the ninth edition of the 'Encyclopædia Britannica.' See THE EARTHLY PARADISE. Consult the 'Lives' or studies by Cary (1902); Clutton-Brock (1914); Jackson, Holbrook (1908); Mackail (1899); Noyes, Alfred (1909); Vallance (1897); Riegel, 'Die Quellen von William Morris's Dichtung, «The Earthly Paradise,» in Erlanger Beiträge zur englischen Philologie (1890); Warwick, 'William Morris, 'His Homes and Haunts' (1912); 'Collected Works of William Morris' (20 vols., London 1913); and Saintsbury, 'Corrected Impressions' (1895).

MORRIS, William O'Connor, Irish jurist and author: b. Kilkenny, 26 Nov. 1824; d. 3 Aug. 1904. He was educated at Oxford, was admitted to the Irish bar in 1854 and was a county court judge from 1872 until his death. He wrote 'Great Commanders of Modern Times'; 'Napoleon'; 'Moltke'; 'Irish History'; 'Hannibal'; 'Ireland: 1798–1898'; 'The Great Campaign of Nelson'; 'The Campaign of 1815'; and 'Memories and Thoughts of a Life' (1895).

MORRIS, an island at the entrance to Charleston Harbor, S. C., south of the main channel. It is east of James Island, nearly a mile south of Fort Sumter and about a mile and a half from Fort Moultrie. At Cummings Point, on the north end of the island, three small batteries took part in the bombardment of Fort Sumter, 12–13 April 1861. Later Battery Wagner was constructed on the south end of the island and the batteries on the north end were strengthened and called Battery Gregg. Attempts were made, in 1863, by the Union forces under Admiral Du Pont and General Hunter, to secure possession of the island, and later by Admiral Dahlgren and General Gilmore. A landing was made on 10 July and on the 11th and 18th an encounter took place, and a regular siege began. See FORT SUMTER.

MORRIS, Ill., city and county-seat of Grundy County, 59 miles southwest of Chicago, on the Illinois River, the Illinois and Michigan Canal, the proposed Lakes to Gulf Deep Waterway, the Chicago, Rock Island and Pacific Railroad; the Chicago, Ottawa and Peoria and the Fox and Illinois Union electric interurbans. The first settlement was made in 1834, and in 1857 the town was incorporated. The surrounding country is a fertile agricultural region in which there are large bituminous coal fields and beds of clay used for brick and tile. Industries include a paper mill with box-board factory in connection, oat meal mill, large tannery, cut glass, heavy hardware, novelties, factories and flour mills. Three national banks containing highest per capita deposits of any in State in towns of 5,000 class. Morris is the seat of one of the largest sheep feeding and shearing yards between Chicago and western ranges. The town is the seat of Saint Angela's Academy. It has a new, all modern high school building and four new modern ward schools. Also has large parochial school. Pop. 4,563.

MORRIS, Minn., village, county-seat of Stevens County, on the Great Northern and Northern Pacific railroads, about 160 miles west by north of Saint Paul. Good water power is obtained from the Pomme de Terre River which is near. The chief product of the surrounding agricultural region is wheat. The principal manufactures of the village are flour and dairy products. The three local banks have combined resources of $1,200,000. There are several grain elevators, flour mills, cement works, fanning mill plant, tiles, elevators, creamery, stock yards and lumber and brick yards. The village has two good schools, a high school, general hospital, parochial school, seven churches, two theatres, an armory, fire hall and a public library. It is also the seat of the West Central School of Agriculture and of Assumption College (R.C.). The value of all taxable property is $650,000. The government is vested in a commission of three with city manager. The municipal receipts average about $35,000. Pop. 2,500.

MORRIS DANCE, or MOORISH DANCE, supposed to have been derived from the Moriscos in Spain, was formerly danced at puppet-shows, etc. It was introduced into England in the reign of Edward III, when John of Gaunt returned from Spain. In the May-games morris-dancers formed an important part with Robin Hood, Friar Tuck, Little John and the Hobby Horse were introduced as characters in the dance. In the reign of Henry VIII the morris-dancers were dressed in gilt leather and silver paper, and sometimes in coats of white and spangled fustian. Suppressed by the Puritans it survives in the north of England.

MORRIS PARK, a once famous New York racetrack.

MORRIS PLAN, The. The Morris Plan of industrial loans and investments takes its name from a Southern lawyer, Arthur J. Morris, formerly of Norfolk, Va., but now of New York. Over 100 companies were organized to operate this plan within the nine years ended 23 March 1919; the capital invested was about $12,000,000, and the amount of money lent to about 660,000 borrowers was near $100,000,000. Loans are now running at the rate of $36,000,000 a year. The urgent though unvoiced demand for a special banking institution for the benefit of the industrial class — such as had existed on the continent of Europe for over half a century — was first met in this country by the Fidelity Savings and Trust Company, of Norfolk, modestly capitalized at $20,000, which began the operation of the Morris Plan on 23 March 1910. The Plan itself may be briefly described as follows:

A man needs a small sum of money to tide him over some urgent financial difficulty. Being unknown at the commercial banks and having no securities he can borrow on, he has to rely on the generosity of a friend, trust to the tender mercies of a loanshark, or seek relief at the counter of a Morris Plan company. Here, if his application is granted, for each $50 borrowed he pays $1 toward the cost of investigation, and gives a promissory note signed by himself and two friends who, as co-makers, guarantee his honesty and earning capacity. This note is discounted at the legal rate of interest, and for each $50 of his indebtedness the borrower agrees to pay $1 a week toward the purchase of a certificate of investment equaling the amount of his loan. At the end of 50 weeks he has paid for this certificate in full, and two weeks later he may cash it at the company's office and pay off his note, which is then due. He has not had to pawn his watch or mortgage his furniture, and instead of paying a ruinous rate of interest to a disreputable money-lender he has dealt with honest people who have treated him fairly and squarely. When his debt is paid he may, if he wishes, subscribe for one or more of the company's certificates of investment, bearing interest at 5 per cent from date of payment, and pay for the same either with cash down or on the instalment plan; and these certificates will be available as security for future loans, in which case no endorsements will be necessary. Many a man who begins as a borrower ends by becoming an investor in interest-bearing Morris Plan certificates; but one does not have to be a borrower in order to buy them.

Most Morris Plan loans are made to wage-earners or small-salaried workers, but many are made to individuals, firms or small corporations to extend their business.

The first Morris Plan companies were organized in the South, but to-day there are more of them in Massachusetts than in any other State, North Carolina coming second. They extend in the Atlantic States from Manchester, N. H., to Atlanta, Ga., and westward to New Orleans, Detroit, Chicago, Minneapolis, Denver, and the Pacific Coast. The New York Company, first capitalized at $100,000 and now at $1,000,000, began business on the last day of 1914; Cleveland's $500,000 company on 8 March 1916; the Boston company, similarly capitalized, three months later; Chicago's $1,000,000 bank began on 27 July 1917, and the half-million dollars Detroit and Los Angeles companies date from the closing months of 1917. The officers and directors of these companies are chosen from among the most representative bankers and other business men in each community, and local interests own a large majority of the stock in every case. A minority interest — varying in amount, but usually substantial — is held by the Industrial Finance Corporation, a Virginia institution with headquarters in New York, capitalized at $3,700,000, and having as its president Gen. Coleman du Pont and as its vice-president and general counsel Arthur J. Morris from whom the Plan takes its name. The purpose of this corporation is to organize Morris Plan companies in response to the demand from all parts of the United States, and to standardize and facilitate their operations. Early in 1919, the local companies began operating the Morris Plan of Retail Trade Acceptances, by which retail dealers in articles of general utility are relieved of the burden of acting as bankers for customers requiring time for the liquidation of their accounts. This natural development of the original loan-and-investment idea will vastly increase the business done by the Morris Plan banks.

A recent development is the formation of The Morris Plan Insurance Society to insure borrowers for the amount of their loans throughout the period of their indebtedness. From November 1917, when it began operating, to 31 March 1919 this Society issued over 28,000 policies for more than $4,000,000 of insurance.

Joseph B. Gilder,
Secretary of the Industrial Finance Corporation.

MORRISON, Arthur, English author: b. 1863. He was for a number of years secretary to a charity-trust in London's East End, and there made the studies utilized in his ‘Tales of Mean Streets’ (1895), and ‘The Child of Jago’ (1896). He wrote also ‘Martin Hewitt, Investigator’ (1896), detective stories; ‘The Dorrington Deed-Box’ (1897); ‘To London Town’ (1899); ‘The Hole in the Wall’ (1902); ‘The Red Triangle’ (1903); ‘Divers Vanities’ (1905); ‘Green Ginger’ (1909); ‘The Painters of Japan’ (1911), and he has collaborated in the production of three plays.

MORRISON, George Ernest, British traveler and Sino-expert: b. Geelong, Victoria, Australia, 4 Feb. 1862; d. 30 May 1920. He was educated at the Melbourne and Edinburgh universities, receiving (1887) degrees M.D. and C.M., crossed Australia on foot (1882–83) and crossed from Shanghai to Rangoon by land (1894); as special correspondent for *The Times* (London) he traveled from Bangkok, Siam, to Yunnan City, China, and round Tonquin (1896), and in the same capacity crossed Manchuria from Stretensk, Siberia, to Vladivostok (1897). He was in Pekin during the Boxer siege (1900) and was present at the Japanese triumphal entry into Port Arthur (1905). In 1907 he again crossed China from Pekin to the French border of Tonquin and thereafter did much travel and exploration in China and Russian Turkestan. On account of his great store of knowledge of Chinese topography and politics he was made political adviser to the President of the Chinese Republic in 1912. He wrote ‘An Australian in China: being the Narrative of a Quiet Journey Across China to Burma’ (1895).

MORRISON, Henry Clay, American Methodist (South) bishop: b. Montgomery County, Tenn., 30 May 1842. He was educated in the public schools and after teaching for several years entered the ministry in 1865. He has held important charges in Louisville, Ky., and Atlanta, and was missionary secretary in 1890–98 when he raised $140,000 for the Board of Missions. He was appointed bishop in 1898, and has been five times elected to the General Conference.

MORRISON, James Dow, American Protestant Episcopal bishop: b. Waddington, N. Y., 1844. He was graduated from McGill University, Montreal, in 1865, took orders in the Episcopal ministry and after holding rectorates at Herkimer and Ogdensburg, N. Y., was consecrated first missionary bishop of the diocese of Duluth in 1897. In 1907 he organized the diocese of Duluth of which he became first diocesan bishop. He has published ‘Fundamental Church Principles’ (1899); ‘Suffragan Bishops’ (1910), and also sermons and addresses.

MORRISON, John Frank, American army officer: b. Charlottesville, N. Y., 20 Dec. 1857. He was graduated from the United States Military Academy and commissioned 2d lieutenant, 20th Infantry in 1881. During his service as a subaltern and captain he was noted as a student of tactics and an authority on general military science. He served in the Santiago campaign and later in the Philippines with distinction. In the Russo-Japanese War he was selected for service as an observer and accompanied General Kurski through the campaign from the Yalu to Liao Yang and Mukden. On his return home in 1905 he was detailed as a student to the nascent Army War College and in the following year went to Leavenworth service schools as instructor. In 1907 he became chief of the department of military art in that institution. The drastic reforms and reorganizations he there carried out led to a high degree of efficiency under his administration. During 1912 and 1913 he was sent to Hawaii and the Panama Canal Zone to plan the defenses of those places. He served on the Mexican border in 1914 as colonel and in 1915 was sent on a mission to China. At the end of 1915 he was promoted to brigadier-general, and to major-general in 1917. In January 1918, shortly after his return from a tour of observation and inspection in France, he was appointed to the newly-created office of Director of Training. His teaching has revolutionized American infantry drill regulations; a number of his lectures have been collected and published, among them being ‘Seventy Problems: infantry tactics, battalion, brigade and division’ (1914); ‘A Study in Troop Leading,’ etc. (in collaboration with E. L. Munson: 1911 and 1918); ‘Training Infantry’ (1914).

MORRISON, John Tracy, American lawyer and politician: b. Jefferson County, Pa., 25 Dec. 1860. He was graduated from the University of Wooster, Ohio, in 1887, and from the law department of Cornell University in 1890. In the latter year he moved to Caldwell, Idaho, where he established his law practice. In the campaign of 1896 he was secretary of the Republican State Committee, and in 1896 and 1900 Republican candidate for Congress, but was not elected. From 1897 to 1900 he was chairman of the State committee, and governor of Idaho 1903–5.

MORRISON, Robert, English missionary and Orientalist, the founder of Protestant missions in China: b. Morpeth, Northumberland, 5 Jan. 1782; d. Canton, China, 1 Aug. 1834. He learned the trade of boot-tree maker. After studying at Hoxton Academy and the Missionary Academy, Gosport, he was ordained in 1807 and as an agent of the London Missionary Society he embarked for Canton. In 1808 he was appointed translator to the East India Company's factory at Canton, and in 1810 began to print the New Testament in Chinese from a text which he had carefully revised. In 1811 he completed a ‹Chinese Grammar,› published in 1815. In 1814 he completed the New Testament, and with the assistance of Dr. Milne, who had joined him in 1813, the translation of the Old Testament which was completed in 1818 and published in 1823. In 1815 he completed a ‹Chinese Dictionary,› published (1815–23), at the expense of the East India Company. Dr. Morrison and his colleagues superintended very extensive printing operations for the diffusion of tracts and Scripture portions among the Chinese, and he founded in 1818 the Anglo-Chinese Missionary College at Malacca. Besides the works mentioned he wrote ‹Horæ Sinicæ, or Translations from the Popular Literature of the Chinese› (1812); ‹Dialogues translated from Chinese into English› (1816); ‹A View of China for Philological Purposes,› (1817), and several educational works in English and Chinese. Consult his ‹Memoir› (1839); Townsend, ‹Robert Morrison› (1888).

MORRISON, Theodore Nevin, American Protestant Episcopal bishop: b. Ottawa, Ill., 18 Feb. 1850. He was graduated from Illinois College, Jacksonville, Ill., in 1870, studied for the ministry at the General Theological Seminary, and took priest's orders in the Episcopal Church in 1874. After being rector of Saint Paul's Church, Pekin, Ill., 1873–76; and of the Church of the Epiphany in Chicago, 1876–99, he was consecrated bishop of Iowa in February 1899.

MORRISON, William Ralls, American lawyer: b. Monroe County, Ill., 14 Sept. 1824; d. 30 Sept. 1909. He was educated at McKendree College, Lebanon, Ill., and served in the Mexican War. In 1852–54 he was clerk of the Circuit Courts of Monroe County, and in 1854 was elected to the State legislature; was admitted to the bar in 1855 and he continued in the legislature until 1859, holding the speakership in the latter year. He served in the Civil War 1861–63, receiving the rank of colonel, and being present at the battle of Fort Donelson. He was a member of Congress from 1863–65 and 1873–87. He introduced the Morrison tariff measure providing for drastic tariff reductions, but it was defeated by a small majority. He was defeated as a candidate for senatorial honors in 1885 by one vote. From 1887 to 1897 he served as member of the Interstate Commerce Commission, of which he was chairman after 1891.

MORRISON, Ill., city, county-seat of Whiteside County, on the Chicago and Northwestern Railroad, about 120 miles west of Chicago and 12 miles east of the Mississippi River. It is situated in an agricultural and stock-raising region. The industrial establishments are furniture and carriage factories, school furniture and refrigerator, stove, range and furnace factories, flour mills and creameries. It has considerable trade in dairy products, livestock and manufactures. There are three banks with combined resources of $2,015,217. The value of all taxable property is placed at $3,000,000. The city has a public library, a museum, courthouse, county offices, city hall, two common schools, a high school and a gaol. Pop. 3,000.

MORRISTOWN, N. J., city, county-seat of Morris County, on the Delaware, Lackawanna and Western, the Morristown and Erie and the Pennsylvania railroads; also Morris County Traction Company line from Elizabeth to Lake Hopatcong 40 miles; about 20 miles west of Newark. It is situated in an agricultural region in which market gardening and fruit growing receive considerable attention. It was settled in 1709–10 and was called West Hanover. In 1740 the name was changed to Morristown in honor of Lewis Morris (q.v.) then colonial governor of New Jersey. It was incorporated in 1865. It is about 700 feet above sea-level and overlooks a beautiful section of country. The place figured prominently in the Revolution; in 1777, from January to May, and from December 1779 to June 1780, Morristown was Washington's headquarters. The old Ford mansion, which he occupied, is now owned by the «Washington Association» who preserve here numerous mementoes of Revolutionary and pre-Revolutionary times. It was here that Samuel F. B. Morse (q.v.) and his associate, Alfred Vail, worked on the electric telegraph experiments about 1837. The shaft of the *Savannah,* the first steamboat to cross the Atlantic, was cast at the old Speedwell Iron Works. Morristown is largely a residential city; its climate, scenery and easy access to the cities of New York, Jersey City, and Newark make it a most desirable location for the homes of city business men. It has considerable trade and ships considerable quantities of flowers, fruit and vegetables. Some of the prominent buildings are the Young Men's Christian Association and the Young Men's Catholic Association buildings, and All Souls' and the Memorial hospitals, post office, Vail Museum, a new high school, new public library and lyceum. There is a beautiful and well-kept park, in which a soldiers' monument has been erected. A monument marks the site of Fort Nonsense, erected by Washington. The city has public and parish schools. At Morris Plains, about four miles northeast of the city, is a State hospital for the insane, which has accommodation for about 1,500 patients, and which cost about $3,000,000. Government is vested in a mayor and council. Pop. 12,548. Consult Tuttle, ‹History of Morristown›; Colles, ‹Authors and Writers Associated with Morristown› (1893); Sherman, ‹Historic Morristown› (Morristown 1906).

MORRISTOWN, Tenn., city and county-seat of Hamblen County, 42 miles northeast of Knoxville, on the Southern and the Knoxville and Bristol railroads. It has manufactures of flour, wagons, agricultural implements, furniture, mantels, hosiery, brooms, concrete blocks, leather, medicines, hardwood tops and panels, canvas gloves, harness, monuments, lumber, etc. It is also a large poultry and stock market, and the zinc, iron and lead mines and marble quarries in the vicinity add to the importance of its industrial interests. Its annual shipments are valued over $3,000,000. It is the largest poultry shipping point in the South. It is the seat of the Morristown Normal and Industrial College for negroes. During the Civil War Morristown was the scene of two engagements. On 10 Dec. 1863 Colonel Garrard's Union cavalry brigade attacked Gen. W. E. Jones' cavalry brigade in works here, and drove it out of them and from the town. Four days later Col. W. J. Palmer, commanding the Anderson (Pa.) cavalry, had a skirmish near the town with a part of General Martin's cavalry brigade of five regiments, and withdrew leaving Martin in possession of the place. On 28 Oct. 1864 the town was held by Gen. John C. Vaughn's brigade of Confederate cavalry. Vaughn was attacked that day by Gen. A. C. Gillem, with a brigade of Union Tennessee cavalry. Vaughn was falling back to a more favorable position, when Gillem charged his right and centre and stampeded the entire brigade, which fell back in disorder to Russellville. Gillem took 224 prisoners, including 19 officers, four guns and caissons, part of the ammunition train, and about 300 stand of small arms. The Union loss was eight killed and 18 wounded. Pop. (1920) 5,881.

MORRO (mōr'rō) **CASTLE**, a former Spanish fort at the entrance to the harbor of Havana, Cuba; also the name of an imposing fortification on the cliffs overlooking Santiago Bay. It was in sight of this fort and under fire of its guns that Lieutenant Hobson and seven men of the United States navy, on 3 June 1898, sank the Merrimac at the entrance to the harbor to prevent the Spanish fleet from escaping. See CUBA; HAVANA; UNITED STATES — SPANISH-AMERICAN WAR.

MORROW, Thomas Vaughan, American eclectic physician: b. Fairview, Ky., 14 April 1804; d. Cincinnati, Ohio, 16 July 1850. Educated at Transylvania University of Lexington, Ky., and graduated in medicine from the Reformed Medical College of the City of New York. He was the pioneer promoter and organizer of medical eclecticism in the West. He established the Reformed Medical College of Ohio at Worthington, Ohio, 1830; the Reformed Medical School of Cincinnati in 1842; the Eclectic Medical Institute at Cincinnati, Ohio, in 1845; was editor of the first eclectic medical journal, and author (with Dr. I. G. Jones) of Jones and Morrow's ‹Practice of Medicine› (eclectic). Dr. Morrow was the first president of the National Eclectic Medical Association

MORROW, William W., American jurist: b. near Milton, Ind., 15 July 1843. He was educated in the public schools of Illinois and California, and was admitted (1869) to the bar and became assistant United States attorney for California (1870–74). He was (1879–82) chairman of the Republican State Central Committee, and (1880–83) attorney of the State Board of Harbor Commissioners. From 1881–83 he was counsel for the United States before French and American Claims Commissions, and (1882–85) before the Alabama Claims Commission. He was chairman of the California Delegation of the Republican National Convention, 1884, and member of the 49th and 51st Congresses (1885–91). From 1891–97 he was United States district judge of the Northern District of California, and judge of the United States Circuit Court and United States Circuit Court of Appeals, 9th Judicial Circuit, since 1897. In 1905 he was the incorporator of the American National Red Cross Society.

MORS, or **MORSÖE**, Denmark, the principal island of the Limfjord in the northwest of Jutland, 23 miles long, 11 miles broad and with an area of 140 square miles. Capital, Nykjöbing (pop. 6,918), on the east coast. It reaches a maximum altitude of 250 feet and its shores are marked by precipitous cliffs. Pop. 24,270.

MORSE, môrs, **Edward Sylvester**, American naturalist and Orientalist: b. Portland, Me., 18 June 1838. He was educated at the Lawrence Scientific School, Harvard University; taught zoology and comparative anatomy at Bowdoin College 1871–74, and at the Imperial University of Tokio, Japan, 1877–80; and in this way added to his reputation as a zoologist a remarkable intimacy with Chinese and Japanese art, especially ceramics, and with the folklore and early archæology of the two countries. His collection of Japanese pottery is now in the Boston Museum of Fine Arts; it keeps his name and he is its curator. In 1881 Morse became director of the Peabody Academy of Sciences, of which he was one of the founders. He is now president of the Boston Society of Natural History. He wrote ‹Early Stages of Terebratulina› (1870); ‹Embryology of Terebratulina› (1872), and other studies showing the non-molluscous character of the brachiopods; ‹First Book in Zoology› (1875, and in German and Japanese versions); ‹Early Races of Man in Japan› (1879); ‹Japanese Homes and their Surroundings› (1886); ‹Glimpse of China and Chinese Homes› (1902); ‹Mars and its Mystery› (1906), and many papers on zoology, ethnology and archæology.

MORSE, Harmon Northrop, American chemist: b. Cambridge, Vt., 15 Oct. 1848. He was graduated (1873) at Amherst College and took the degree of Ph.D. (1875) at the University of Göttingen. He became assistant in chemistry (1875–76) at Amherst College, then (1876–91) associate professor of chemistry at Johns Hopkins, and professor of analytical chemistry and adjunct director of the chemical laboratory (1891), and is now professor of inorganic and analytical chemistry and director of the chemical laboratory. He was given the degree LL.D. by Amherst 1915. Special work has been done by him in investigating osmotic pressure. He wrote ‹Exercises in Quantitative Chemistry› (1905).

MORSE, Harry Wheeler, American physicist: b. San Diego, Cal., 25 Feb. 1873. He was graduated (1897) at Leland Stanford Jr. University, and took the degree of Ph.D. (1901) at the University of Leipzig. He was instructor of physics (1902–10), assistant professor (1910–12) at Harvard and professor of chemistry at the University of California (1912–13) and from 1913 has had charge of scientific work for the Western Precipitation Company, Los Angeles. He translated Ostwald's Letters to a Painter on the Theory and Practice of Painting (1906) and is joint author of 'Ostwald's and Morse's Elementary Chemistry' (1907), and author of 'Chemistry and Physics of the Lead Accumulator' (1912). Numerous monographs on spectroscopy, fluorescence, diffusion, electrochemistry, etc., are from his pen.

MORSE, Hosea Ballou, American authority on Chinese affairs: b. Brookfield, N. S., 18 July 1855. He was graduated (1874) at Harvard University and was appointed in the same year assistant in the Imperial Chinese Customs service, being promoted (1887) to deputy commissioner and (1896) commissioner. From 1903–07 he was statistical secretary (commissioner of customs) to the inspector-general of customs, retiring 1909. By Imperial decree (1885) he was sent on a special mission connected with the terminating of the Franco-Chinese War, and fulfilled special duties (1885–87) connected with the reorganization of the subsidized China Merchants' Steam Navigation Company. In 1889 he was appointed special commissioner to arrange for opening Hunan Province to foreign trade. For his numerous services he has received (by Imperial rescript) The Decoration of the Double Dragon, III division, 2d class (1885); Double Dragon 1st class (1903); Order of Chia Ho, 3d class, Republic of China (1916). He has written 'The Currency of China' (1906); 'Trade and Administration of the Chinese Empire' (1908, new ed. 1913); 'Guilds of China' (1909); 'International Relations of the Chinese Empire' (1910–18).

MORSE, Jedidiah, American Congregationalist clergyman and geographer: b. Woodstock, Conn., 23 Aug. 1761; d. New Haven, 9 June 1826. He was graduated from Yale in 1783; studied theology under Jonathan Edwards; was pastor at Charlestown, Mass., from 1789 to 1820; and spent his last years in New Haven. He was intensely orthodox; established in 1805 the *Panoplist,* a religious journal combating Universalist views; and was an able and successful teacher. He wrote 'A Compendious History of New England,' with Elijah Harris (1804); 'Annals of the American Revolution' (1824), and a series of excellent biographies.

MORSE, John Torrey, American historian: b. Boston, 9 Jan. 1840. He was graduated at Harvard in 1860, and was lecturer on history there from 1876 to 1879. For two years he was associated with Henry Cabot Lodge in the editorship of the *International Review.* Served on board of overseers of Harvard University for 11 years and was member of the Massachusetts legislature in 1875. He also studied and practised law in Boston for a time and wrote treatise on 'Law of Banks and Banking' which has now reached seventh edition; also 'Law of Arbitration and Award.' His literary work has been chiefly in historical biography, and he has edited the 'American Statesmen' series, which is ranked among the best biographical works for the interpretation of American history. For this series he has written 'Abraham Lincoln' (1893); 'Benjamin Franklin' (1889); 'John Adams' (1884); 'John Quincy Adams' (1883); and 'Thomas Jefferson' (1883); his other works include 'Life of Alexander Hamilton' (1876); and 'Life and Letters of Oliver Wendell Holmes' (1896); also 'Life and Letters of Colonel Henry Lee' (1905).

MORSE, Richard Cary, American clergyman: b. Hudson, N. Y., 19 Sept. 1841. He was graduated (1862) at Yale and took (1865) the degree of A.M., when he studied theology at Princeton and Union Theological seminaries (1867). From 1867–69 he was assistant editor of the *New York Observer* and was ordained (1869) to the Presbyterian ministry. He was general secretary of the international committee Y. M. C. A. (1869–1915), continuing as consulting general secretary. His work has been connected with the supervision and extension of the Y. M. C. A., especially in North America; but his labors have taken him on tours to India, Australia, China, Korea, Japan, the Philippines and Russia. He has written 'Robert R. McBurney, a Memorial' (1899); 'Polity of Young Men's Christian Associations' (1904); 'Fifty Years of Federation of the Y. M. C. A.' (1905); 'History of the North American Y. M. C. A.' (1913).

MORSE, Samuel Finley Breese, American inventor and artist: b. Charlestown, Mass., 27 April 1791; d. 2 April 1872. He was the eldest son of the Rev. Jedidiah Morse (q.v.). After graduating at Yale in 1810, he visited England with Washington Allston (q.v.) to study painting. In 1813 his first attempt at sculpture, a 'Dying Hercules,' won for him the gold medal of the Adelphi Society, and he received the same from the hands of the Duke of York. He returned to New York in 1815, and in 1824–25 organized an association which became the present National Academy of Design. He was its first president and continued in office for 16 years. He again spent three years in study in Europe, and then returned to New York to take the professorship in the University of the City of New York.

Morse had always been fond of the study of chemistry and natural philosophy, and it became at last a dominant pursuit with him. In consequence of his intimacy with Prof. J. Freeman Dana, who was lecturing in the same institution on the electro-magnet, Morse became interested in electrical matters, and in 1832, while returning home from Havre on the packet ship *Sully,* he first conceived the idea of the telegraph. But though thus early devised, yet circumstances prevented the complete construction of the first recording apparatus in New York until 1835, when he exhibitetd it at the New York University building. In 1837 he made another and more perfect exhibition, and filed his caveat at Washington. He now considered his apparatus sufficiently perfected for commercial introduction, and in 1838 he asked Congress to construct an experimental line from Washington to Baltimore to show its practicability. From the skepticism of many and the ridicule of others, Morse's request was not acted upon by Congress, and, disappointed and almost disheartened, he repaired to England in hopes of getting some foreign government to aid him. The result of this visit was a refusal to grant him letters patent in England, and the obtaining of a useless *brevet d'invention* in France. For four years he struggled and put up with many privations, and, as if it were designed to try him up to the last moment, no recognition of the matter was taken till the last night of the Congressional session. He retired to bed disheartened and discouraged before the session was closed. But in the morning — the morning of 4 March 1843 — he was startled with the announcement that the desired aid of Congress had been obtained in the midnight hour of the expiring session, and $30,000 placed at his disposal for his experiment between Washington and Baltimore. In 1844 the work was completed, and demonstrated to the world the practicability and the utility of the Morse system of the electro-magnetic telegraph. The first message, «What hath God wrought?» was sent from the United States Supreme Court room in the Capitol at Washington to Baltimore, 24 May 1844. From that day the telegraph was a success.

Honors were showered upon him by European sovereigns and governments. Probably no American has ever received so many marks of distinction. In 1848 Yale College conferred on him the complimentary degree of LL.D., and in the same year he received the decoration of the Nishan Iftichar in diamonds from the sultan of Turkey. Gold medals of scientific merit were awarded him by the king of Prussia (set in a massive gold snuff box), the king of Würtemberg, and the emperor of Austria. From the emperor of the French he received in 1856 the cross of chevalier of the legion of honor; in 1857 from the king of Denmark the cross of knight of the Dannebrog; and in 1858 from the queen of Spain the cross of knight commander of the Order of Isabella the Catholic. The sum of 200,000 francs was presented to him jointly by the principal governments of Europe. It has been said that much of this money was spent in the ceaseless litigation and lawsuits in which he was involved in the defense of his patent rights.

Professor Morse also had the distinction of laying the first submarine telegraph line, which was done in New York harbor in 1842. He likewise set up the first daguerreotype apparatus and was associated with John W. Draper in taking the first daguerreotypes in America. A letter from Professor Morse to the Secretary of the Treasury in 1843 seems to contain the earliest suggestion of the possibilities of an Atlantic cable. His last public act was the unveiling of the statue of Benjamin Franklin, in Printing House Square, New York. Consult Prime, ‹Life of S. F. B. Morse› (New York 1875) and Morse, E. L. (son), ‹Samuel Finley Breese Morse, his Letters and Journals› (2 vols., Boston 1914).

MORSE, Sidney Edwards, American journalist and inventor, son of Jedidiah Morse (q.v.) and brother of S. F. B. Morse (q.v.): b. Charlestown, Mass., 7 Feb. 1794; d. New York, 24 Dec. 1871. He was graduated at Yale in 1811; studied law; established the *Boston Recorder* in 1815 and the *New York Observer* in 1823, the pioneers of American religious journalism; invented a flexible piston-pump in 1817 and the cerographic method of printing maps in 1839; improved a bathymetre for deep-sea soundings; and, like his father, was an able and successful geographer. His ‹New System of Modern Geography› ran to half a million copies.

MORSE, Sidney H., American sculptor and editor: b. Rochester, N. Y., October 1832; d. San Mateo, Fla., 18 Feb. 1903. In youth he worked at marble-cutting and acquired a taste for sculpture. Later he studied at Antioch College and afterward began to preach in Unitarian pulpits in the West; still later made further preparation for the ministry at Harvard, and for some time was settled in Haverhill, Mass. From 1865 to 1872 he was editor of the *Radical,* a worthy successor of the famous *Dial.* Morse counted among his friends and contributors Emerson, A. B. Alcott, Samuel Johnson, Samuel Longfellow and many others prominent in literature and reform. When he discontinued the *Radical* he turned with enthusiasm to sculpture and produced many notable works. He made a bust of Emerson, which is in the Second Church, Boston, the present edifice of the society to which Emerson ministered (1829–32), and another of the same subject, regarded by Emerson's friends as the best extant. His other subjects include Channing, Parker, James Martineau, Walt Whitman, Carlyle, Thomas Paine, Lincoln, Holmes and President Cleveland. Morse wrote much for periodicals and attained fame as a lecturer. One of his poems, ‹Sundered,› is to be found in Emerson's ‹Parnassus.›

MORSHANSK, môr-shänsk', Russia, capital of the government Tombov, on the navigable river Tsna and on the Syfran-Vyasma Railway. It has a gymnasium for girls, a city bank and factories producing tobacco, soap, tallow, spirits, etc., besides doing a lively trade in grain. Its population in 1911 was 31,802.

MORSÖE, mŏrs'ē-ē. See Mors.

MORTALITY, a term applied to that branch of investigation which determines the proportion of the number of persons who die in any assigned period of life or interval of age, out of a given number who enter upon the same interval, and consequently the proportion of those who survive. Tables showing how many out of a certain number of infants, or persons of a given age, will die successively in each year till the whole become extinct, are generally called tables of mortality. There is no fixed number of lives upon which such tables are based, but the observation of a large number is indispensable to accuracy, and the larger the number that can be duly observed the greater will be the degree of accuracy attained. It must always be borne in mind, however, that a strict observation of a moderate number will yield truer results than a looser induction from a larger number. The basis of such calculations must be an accurate register of the number of births and deaths, and in the case of the latter, at what ages, in a given district or extent of country.

In Great Britain the bills of mortality, or abstracts from parish registers, were long the only means of arriving at these results; but being found very imperfect and unsatisfactory, they were supplanted in 1836 by a general regis-

Saml. F. B. Morse.

tration. The results furnished by such tables are very various and of great interest. The registers, if kept with sufficient accuracy and minuteness, enable us to determine the proportion of deaths, not only at different ages and in different regions, but at different seasons, in persons of different occupations and habits, in towns or the country; and thus afford valuable materials for the science of political economy. Although much more attention has been paid to this subject in recent times, yet the observations have not been so extensive nor so accurate as is desirable.

Although the collection of regular statistics of mortality is of recent origin, the subject has always excited much interest, and many general facts have been collected regarding it. The tendency of mortality to diminish with the progress of civilization has been satisfactorily established by statistics. The average rate of mortality is affected by regular or constant causes, such as race, climate, age, sex, profession, social position, density of population, political institutions, habits, etc., and by such irregular or occasional causes as war, famine, pestilence, etc., but notwithstanding the interruption of these occasional causes a constant tendency to a mean has been found to exist in any given state of society. The fact that the tendency of population to increase or diminish is quite independent of the rate of mortality was first established by Malthus, who showed that the increase of population depended on the facility of procuring the means of subsistence and not on the duration of life. The mortality in the United States, for example, is greater than in England, yet the population of the United States doubles itself in 25 years and that of England in 43 years, while in various European countries which have a lower mortality than the United States, the population will not double in a century.

Some statists have attached considerable importance to the effects of race on population. It is extremely difficult, however, to establish anything in regard to race independently of circumstances and social habits. It has been shown, for example, that the average mortality among the Jews in Prussia is less than among the Christians, that the mortality varies greatly among the various races who inhabit the Austrian Empire, being least among the Germans, and that a similar difference prevails in the departments peopled by various races in France, but all such evidence is open to the most obvious exceptions. The influence of climate on mortality is inseparably associated with that of migration. It cannot be established that any climate, except perhaps the extremes of heat or cold, moisture or dryness, is in itself exceptionally favorable or unfavorable to human life, but change of climate is frequently adverse to it.

The most remarkable fact in respect to age is the great mortality which commonly takes place among children under five years of age. This is especially remarkable in large towns, but is not wholly confined to them. Although the diseases to which infancy is liable may naturally account for part of this excessive mortality, the greater part of it must be attributed to ignorance and want of due care in the training of children, partly arising from the unfavorable circumstances in which, through the too rapid increase of population, they are brought into the world. This is both directly and indirectly a considerable cause of the extra mortality of large towns and other dense centres of population. The question whether city or country life is most conducive to a low rate of mortality is still undecided. Direct statistics prove nothing, as the death rate of towns is raised by immigration from the country and other causes. In regard to sex it is established that women live longer than men, and that among men the married live longer than the single. The condition of life in respect of poverty or wealth is known to have a considerable influence on mortality. Dividing France into two classes, rich and poor, the annual mortality was found to be 1 in 46 in the former and 1 in 33 in the latter. This gave to the rich an average duration of life of 57 and to the poor one of 37 years. See LONGEVITY; VITAL STATISTICS.

MORTAR, a calcareous cement used in building. It differs in its characteristics according to the nature, proportions or treatment of its constituents. The proportions vary from one and one-half to four or five of sand to one of lime. Hydraulic mortar is made from certain limestones which include in their composition so large a proportion of iron and clay as to enable them to form cements which have the property of hardening under water and are called hydraulic limestones. The proportions of clay vary in different quarries, and often in the same from 8 to 25 per cent. See CEMENT; LIME.

MORTAR, or MORTER, a vessel of iron, porcelain or stone used by pharmacists and others in preparing powders and other medicines. Also a piece of ordnance. See ORDNANCE.

MORTAR, utensil employed by the Indians of America and other semi-civilized races for the grinding or mashing of grains and other substances used as food or for other ends. The Indian mortar naturally had a different name in each tribe, and some of these names were familiar to the whites. A survival of these Indian mortar names is the metate of Mexico (q.v.) derived from the Aztec word *metal*. The mortar has many forms ranging from a flat stone to a deep receptacle of stone, bone or wood in which the grain or other substance is reduced by pounding or grinding to a floury or plastic state. Throughout the area occupied by the Pueblo Indians in the United States, and in Mexico, Central America and the greater part of South America, and especially in Colombia, Venezuela and the Pacific Coast countries the grinding of grain, seeds, nuts, roots and other substances is done on a flat stone, generally rectangular in form. For the most part the grinding is performed by means of a stone muller more or less cylindrical in shape, which is rarely used as a roller, the substances being crushed between the metate and the muller by pressure and rubbing. This was the process used throughout the great corn belt stretch from Arizona to southern Chile at the time of the discovery of America; and throughout this vast region it is the process generally in use to-day, more especially among the Indians and mestizos for reducing corn and other substances to a condition for cooking.

Forms of Mortars.— Throughout other parts of North America there were many forms of mortars distinctly different from those in use in the region already indicated, but closely related to one another in shape. Among the Iroquois and other northern and eastern tribes of the United States and parts of Canada the natives made use of wooden mortars hollowed into the top of a block cut from the trunk of a tree. In this hollow, which was of considerable size and depth, the corn or other substance was put, in a dry or wet condition, and pounded into a more or less fine powder or into a soft, semi-liquid mass, by means of a long wooden pestle, with a pounding surface at both ends. The remains of very primitive mortars in many parts of the American continents show the various processes through which the modern mortars have passed to reach their present perfection. Originally a rough unworked flat stone was used as a grinding surface and an unshaped rounded stone served to do the pounding. From this primitive utensil to the carefully shaped metate of the Mexican or the handsomely carved and hollowed mortar of the Alaskan and British Columbian tribes is a long step which bridges a lengthy period of cultural development. In the granite rock of California mortars in the shape of excavations are frequently found on the sites of old Indian villages. Some of these are very primitive in form, while others, evidently of a much later development, are carefully shaped and seem to follow a regular plan of structure. It is probable that the flat stone metate form and the hollow mortar form both originated in pounding grain on a flat surface, the two natural methods of preventing the loss of the pulverized grain being to reduce the pounding to rubbing or rolling, and to pound the grain, in a deepish hole, as was done in the California granite rock. The tribes of the great forest area of the North, having no hollow rock beds or stones easily worked, hollowed out the ends sections of tree trunks or sides of logs by means of fire which also hardened the inner surface of the mortars, dried the wood and made them very durable. In regions where stone and wood were not available, bone, rawhide and other materials were converted into mortars for the grinding of food materials. In the whale country some of the races addicted to whale hunting used the vertebræ of that animal for mortars. Some of these are still employed. In the Eastern States of the United States primitive mortars made of hollowed but otherwise unshaped boulders are frequently encountered; and similar mortars are formed in California, side by side with other globular mortars, which are evidently but a more artistic development of the boulder form. A further evolution of the artistic form was reached when stones were quarried from the rocky bed, shaped to exact pre-determined form and proportions and frequently decorated with conventional forms, mystic signs or figures of household gods.

The pestle took upon itself as many shapes and designs as the mortar, and like relation of the latter to the metate, it was first cousin to the muller, both of which had their origin in the rough, unworked stone used by primitive man to pound or crush his food, and other objects. Some pestles were heavy and several feet long; others were short instruments which could be used with one hand. Metates and mortars were of many shapes, sizes and designs, and their uses were almost as varied as their forms.

Uses of Mortars.— Indians, throughout the buffalo country, put the buffalo meat into a rawhide bag which they placed in a hole in the earth with the open mouth upward. While here they pounded the meat into shape for pemmican. Some Indians placed their shallow mortars in closely-woven baskets considerably larger than the mortars so that the grain that fell from the latter, in the process of grinding or pulverizing, might be saved. Others of the Pueblo Indians placed a basket-shaped hopper in the mouth of the mortar to prevent the pounded grain from hopping out. It is probable that very large «mortar holes» found in rock were also used as boiling pots, in which the heated water was obtained by dropping superheated stones into the hole. The large wooden portable mortars of the forest-region Indians were generally set on the ground so as to make them firm and steady. The ordinary metate of Mexico and Central America has generally four legs upon which it stands steadily. In many cases these give it an artistic appearance. Most of these metates are made of lava rock, especially in the districts where lava is plentiful. Metates are made of rocks of different grades of coarseness. Thus it is possible, by passing ground grain from one metate to another, to finally obtain a flour as fine as the finest turned out by the best modern mill machinery. Fine metates and mortars are also made from granite, limestone, sandstone and other rocky material. Perhaps the most artistic development of the mortar is to be found among the Haida Indians of Alaska, who probably learned their art from Asiatic tribes. Not only are mortars of a great variety of forms and designs but they are also of many sizes, ranging from tiny little vessels to huge excavations. The reason is that they were put to a variety of uses. The smaller mortars were employed as receptacles in which to grind paints, medicines, shells, tobacco and other substances used in medicine, personal decoration, ceremonies, incantations and dances. All the grinding of corn and other food products was almost universally done among the American Indians by women; but in the case of the ceremonial substances, especially those considered of a sacred nature, where the efficacy of the charm, ceremonial use or medicine depended upon the manner in which the grinding was done, this work was generally left to the medicine men, who were learned in all the ceremonial forms and traditions of the tribe.

Bibliography.—Hodge, ‘Handbook of American Indians’; Morehead, ‘Prehistoric Implements’; ‘The American Indian in the United States’; Morgan, ‘League of the Iroquois’; Nordenskjöld, ‘Cliff Dwellers of the Mesa Verda’; Schoolcraft, ‘The Indian Tribes of the United States’; Thurston, ‘Antiquities of Tennessee.’

MORTARA, môr-tä'rä, **Edgar**, Jewish boy whose forcible removal from his parents by the orders of the archbishop of Bologna in 1858 aroused great excitement in Europe and led to protests from several powers, but the Pope declined to interfere. The plea made in justification of the act was that Mortara had been early baptized into Christianity by a Roman Catholic maid-servant. The Roman Catholic authorities, however, declined to return him; and despite the many protests in the matter, he remained, of his own choice in 1870, with the Church and entered the Augustinian order. Consult 'The True Story of the Jewish Boy, Edgar Mortara' (1860), and Vollet, 'Edgar Mortara' (1881).

MORTARA, môr-tä'rạ, Italy, capital of the province of Pavia, on the Arbogna, also chief town of the Lomellina, and junction of the Novara-Mortara-Alessandria, the Mortara-Milano and the Vercelli-Mortara-Pavia and the Mortara-Casale railways. It has a Gothic church (San Lorenzo) and the Santa Croce convent church, also a theatre, gymnasium and technical school. It has manufactures of machinery and hats and does considerable trade in its rice and cheese products. The Austrians under Duke Albrecht won a battle here against the Piedmontese in 1849. It had a population of 10,468 in 1911 for the entire commune.

MORTE D'ARTHUR. This great English collection of Arthurian romances, written before 1470 by Sir Thomas Malory, as one of the cardinal books whose influence has reached beyond any mere personal fame. Personally, indeed, Malory has remained almost unknown. Even the probability that this 15th century gentleman and soldier served with Richard, Earl of Warwick, pattern of chivalry, was recovered only 25 years ago; but 400 years have proved the vitality of his book. After inspiring the conduct of noble English youth for generations, it was reinterpreted in Tennyson's most popular poem, 'The Idylls of the King'; and, surviving so unusual a competition, it is still reprinted, read and loved. Yet as a translation, in great part from known French sources, it is not in our modern sense original. Therefore the reasons for its fame are the more significant as going to the roots of permanent literary interest. The first reason, of course, is style. Writing in the early days of English prose, Malory has the dignity and ease of such early historians as Froissart; but his even and leisurely pace does not preclude the force of direct diction. This rare combination of dignity with simplicity has been sufficient to preserve his work without any great strength of structure, any compelling movement of the whole. The 'Morte d'Arthur' is not composed as a whole, not planned to lead us on stage by stage to a culmination. True, the closing books are felt as the tragic conclusion of Arthur's chivalry in a world of violence; but with many of the preceding stories it has no specific connection. Rather Malory worked as the mediæval romancers from whom he drew had worked before him. Collecting all the well-known stories — and a few less well known — that had come to be associated with the great name of Arthur, he used them much as he found them; and he told each for itself. Though he sometimes suggests complication of plot or development of character, he never worked for these in the ways of the modern novelist. The Renaissance had but touched England; and its literary ideas, even if they had been prevalent, would hardly have moved so thorough a mediævalist as Malory. He turned away from the actual wars of the Roses to the legendary wars of Arthur's knights because of his intense sympathy with the ideals of a passing chivalry. He is far more mediæval than Chaucer. Though in style he has his own distinction, in composition he is the typical mediæval transmitter.

Every one of the stories that he thus brought together has a long history. Many of them reach far back into folklore. Most of them before they came to him had been told over and over again. The successive versions, their relations, their combination, the transference of a tale from Gawain to Percival and then to Galahad, the building up of a cycle of Grail stories and the attaching of this to the Arthurian cycle — all these have claimed much scholarly investigation and still offer problems as difficult as they are significant. But of this Malory was no more aware than the thousands of readers who have gone to him, not for history or folklore, nor for psychology or drama, but for the solace and inspiration of high adventure.

Beginning with the perennial story of the prince wondrously born and sent in the nick of time to claim the crown, right wrong, and establish a kingdom of justice, courtesy, and honor, he ends with the traditional hope that the same king, though in his stricken age borne away to the Isle of Avilon, may yet return to reign. Only to the latter books belongs properly the title 'Morte d'Arthur,' which is borne also by several mediæval poems. Between the young prince smiting the stone with his miraculous sword and the old king fighting his last battle against treason in the dim West, what a store of quests and deliverances, what a goodly array. Balen and Balan still show a primitive wildness in spite of the faint hint of the coming Grail; and the fairies, though crowded to the back of the stage by the stir of chivalry, still peep from their Celtic twilight. Morgan le Fay is dangerous in revenge. The Lady of the Lake gives the magic sword, and to her at the last it returns. Merlin the wizard, after all his triumphs of wisdom and skill, «was assotted and doted on one of the ladies of the lake.» But these are only old echoes. The stories are of chivalry; of Beaumains, youth proving its unconquerable force; of Tristram and Iseult, the immortal lovers, and Guenever, the queen mistress who drew the peerless Lancelot across steel and fire and even across loyalty; of Gawain, his earlier fame tarnished, but still the courteous; of a hundred good knights who sought wild paths and frightful risks and stiff battles because they must make life an adventure.

Following these old adventures with adventurous hearts, readers have always been glad that they are numerous, and have not missed in the thronging of Malory's stories that unity which he did not seek. From the conquest of Rome to the earliest adventures of Lancelot, from Beaumains to Tristram, Malory goes leisurely, but always with zest; and by the way he pauses for yet other stories. The 'Morte d'Arthur' is a storehouse of romance. And above all the other quests, above the errant fighting throng, shines the supreme quest of the Holy Grail, the great romance of the Mass. Malory's aim, then, was not that modern literary distinction which comes from originality of composition; it was to make men love the high things that he loved. His work was to him the handing on of the great traditions of chivalry. Caxton, who printed it in 1485, well calls it a «noble and joyous book.»

Charles Sears Baldwin.

MORTEN-MÜLLER, mōr'tĕn-mül'lĕr, Norwegian painter: b. Holmestrand, Christianiafiord, 29 Feb. 1828; d. 1911. He began to study art in Düsseldorf (1847) first under Tidemand and Eude, and later as a pupil in the academy under J. W. Schirmer. He removed to Stockholm in 1850, but in 1866 opened an art school in Christiania under government patronage. He returned to Düsseldorf in 1871 and devoted himself to setting forth the wild scenery of his native country in a series of vast canvases. Fiord, valley and mountain height are represented with fine imaginative yet truthful line and color. The most noteworthy of his landscapes are ‘Norwegian Landscape’ and ‘Entrance to Hardangerfiord’ (both in the National Gallery of Christiania); ‘A Fir Forest’ (in the Gallery at Hamburg); ‘Romsdalfiord,’ with historical figures put in by Tidemand (1876); ‘Start of the Fishing-boats by Night’; ‘Waterfall and Pine Forest’ (1879); ‘Fisherman's Cot in Christianiafiord’ (1880); ‘Woodland Lake by Moonlight’ (1892). His works combine romantic picturesqueness with color power of startling realism. In 1874 he was appointed court painter and member of the Stockholm Academy.

MORTGAGE, môr'gāj («dead pledge»), *in law,* the conveyance of property, movable or immovable, as security for the payment of a debt on the condition that if the debt be duly paid the conveyance shall be void. The term is applied: (1) To the act of making such a conveyance; (2) to the deed by which such conveyance is made; (3) to the rights thereby conferred on the mortgagee. He who makes the mortgage is the mortgagor; he for whose benefit it is made is the mortgagee. Whatever may be sold may be mortgaged. Mortgages may therefore cover chattels or real estate. Mortgages must be in writing, either in one single instrument containing the whole case or in two, one containing the conveyance, the other the condition of the conveyance, this last document being the «defeasance.» A deposit of titledeeds, with a verbal agreement, creates an equitable mortgage in some States which recognize this proceeding as a mode of securing a debt. The different States regulate the time in which mortgages are to be recorded, in order to protect innocent purchasers, but an unrecorded mortgage is good as against the mortgagor or any purchaser knowing of its existence at the time of his purchase. The tendency of courts now is to regard a mortgage as a lien rather than a conveyance of the land, and it is now generally regarded as a mere security for the payment of a debt. In those States which recognize chattel mortgages (or mortgages of personal property), a record of the same within a specified time is required to render them valid as against other claimants. See also Foreclosure.

MORTGAGE BANKS. See Banks and Banking — World's System.

MORTIER, môr'tyā', **Edouard Adolphe Casimir Joseph,** Duke of Treviso, French marshal: b. Cateau-Cambrésis, 13 Feb. 1768; d. Paris, 28 July 1835. He entered the army in 1791, fought in the campaigns of 1792 to 1795, was brigadier-general in 1798 on the fields of South Germany and Switzerland, and besieged (1803) Hanover, being raised (1805) to rank of marshal. In the war with Prussia he commanded the army against the Swedes and was victorious at Anklam (1807), whereupon he agreed to an armistice at Schlatkow (18 April). He commanded the left wing of the army in the battle of Friedland and was created Duke of Treviso (1808), to be given in that year command in Spain, where he won the battle of Ocaña (1809). He commanded the young Guards in the Russian campaign and also in 1813. In 1814 he, together with Marshal Marmont, defended Paris, but submitted to Louis XVIII and was made a peer of France. By March 1815 he had again joined the forces of Napoleon, thereby losing his title of peer, on the latter's defeat and the second Restoration. He was elected (1816) member of the Chamber of Deputies and retained the place till the end of 1818. In 1819 the dignity of the peerage was restored to him, being made hereditary in 1824. He was made chief chancellor of the Legion of Honor (1834) and became Minister of War and president of the council in the same year. He was killed (1835) by the infernal machine of Fieschi at the king's side as he was passing along the Boulevard du Temple, Paris. Monuments have been erected in his memory in his native city and also Lille.

MORTIFICATION. See Gangrene.

MORTIMER, môr'tĭ-mėr, **John Hamilton,** English artist: b. Eastbourne, Sussex, 1741; d. 1779. After studying under Sir Joshua Reynolds, he carried off the first prize of the Society of Arts, London (1763). He was elected R.A. in 1779. A bold and vigorous draughtsman and a good colorist, he was fond of dramatic scenes in which there was an element of the terrible. His style and manner are well exemplified in the pictures ‘Battle of Agincourt’; ‘Voltigern and Rowena’; ‘Hercules Slaying the Hydra’; now in the South Kensington Museum. He was very successful as an etcher, and designed stained glass for Salisbury Cathedral and Brasenose College, Oxford.

MORTIMER, Roger, 8th Baron of Wigmore and 1st Earl of March, English noble: b. about 1287; d. Smithfield, 29 Nov. 1330. He had been convicted of treason in the reign of Edward II and pardoned; but notwithstanding the king's clemency took part in the rebellion of the Earl of Lancaster, and was made prisoner in 1322. Having escaped from the Tower, where he was confined, he went to France and at Paris in 1325 met Queen Isabella, who had been sent thither by Edward to negotiate a treaty. Fascinated by his pleasing address, the queen was soon known to be living in guilty intimacy with the exile, and, having secured the person of her young son, began to mature plans with Mortimer and the other leaders of the barons for getting possession of the kingdom. Mortimer went with her to England in 1326; the king was deposed and his son Edward III proclaimed in his stead, and for some years Isabella and her paramour governed the realm in the name of the young prince. Mortimer is popularly regarded as responsible for the death of the dethroned monarch in his prison (1327). The failure of the Scottish expedition in 1327, and the «shameful peace» with Scotland in the following year, had wounded the pride of the English people. The nobles wearied of his arrogance and Edward resolved to take the sceptre into his own hands. While the queen and Mortimer were in Nottingham castle during the session of Parliament at that town, the king and Lord Montacute with attendants entered by night through a subterranean passage and carried off the earl. The king summoned a new Parliament to meet him at Westminster, and on 26 November Mortimer was condemned by this Parliament and executed three days later.

MORTMAIN, môrt′măn, in English law, lands held by a corporation were said to be held in mortmain (*mortua manu*, by dead hand), because they were then not alienable. The expression has particular reference to estates held by religious and eleemosynary corporations in England. At one time half the land in England was vested in religious houses. As early as 1279 the English Parliament began to deal with the evils arising from the transfer of lands to religious corporations; the lords of the soil were deprived of escheats or other feudal profits: «a dead hand yieldeth no service.» In 1736 by the Mortmain Act the power of devising land by will to charitable purposes was destroyed. The law on this subject was consolidated by the Mortmain and Charitable Uses Act (1888), under which no bequest for a charitable purpose was to involve the acquisition of land. The Act of 1891 enacted that land may be devoted to any charitable use, but it must be sold within a year from the testator's death, unless the time be extended by certain authorities. It also permits the acquirement of land directed to be acquired for a charity if the court or the charity commissioners consent. A large number of acts from 1841 onward have exempted from mortmain restrictions land bequeathed for school sites, burial-places, places of worship, literary and scientific institutions, public parks, but maximum limits are imposed in several cases.

The old English statutes of mortmain have not been regarded as in force in the United States except in Pennsylvania, where the dedication of property to superstitious uses, and grants to a corporation without statutory license, are forbidden. In some States the right of religious corporations to hold land, and the power to make, devise or bequeath land to religious societies or charitable purposes, is restricted.

MORTON, Charles, English-American Puritan divine: b. Pendavy, Cornwall, 1627; d. 1698. He studied at Wadham College, Oxford, was appointed (1655) rector of Blisland, but his puritanic tendencies caused his ejectment in 1662. He was made master of the dissenters' school at Stoke Newington, London (1685), where Daniel Defoe was numbered among his pupils. Prosecutions by the ecclesiastical courts caused him to migrate (1686) to New England and he became minister of the first church at Charlestown, Mass. He was prosecuted for a seditious sermon (1687) but acquitted. He got into close connection with Harvard and was given (1692) the management of the inward affairs of the college with the title of vice-president. His succession to the college's president, Increase Mather, seemed likely but for his death. He approved the prosecutions for witchcraft at Salem. Consult Quincy, Josiah, ‹History of Harvard University› (Cambridge, Mass., 1840).

MORTON, or MOURT, George, Puritan colonist: b. York, England, about 1585; d. 1628 (?). He affiliated himself with the Puritans in 1600 and settled in Holland, but was for some years previous to 1620 London agent for the Puritans. Authorities disagree as to his career, some placing his emigration to America in 1620 while others fix it at 1623, and the same uncertainty prevails as to his death, the dates varying from 1624 to 1628; there is no conclusive evidence as to whether it occurred in England or America. For many years he was credited with the authorship of Mourt's ‹Relation or Journall of the beginning and proceedings of the English Plantation at Plimoth,› published in London in 1622. Careful investigation, however, seems to prove conclusively that the authorship must be credited to Winslow and Bradford, and that at most only a small portion of it can be claimed by Morton. The work, which is regarded as the most authentic history of the times in existence, has been several times reprinted. Consult ‹Mourt's Relation,› with introduction and notes by Henry Martyn Dexter.

MORTON, Henry, American scientist: b. New York, 11 Dec. 1836; d. there, 9 May 1902. He was graduated from the University of Pennsylvania in 1857 and became professor of physics and chemistry at the Episcopal Academy of Philadelphia in 1860. His lectures in 1863 at the Franklin Institute in Philadelphia attracted attention throughout the United States and Europe by reason of his brilliant and unique experiments. He was one of the founders of the Philadelphia Dental College in 1863 and its first professor of chemistry, and in 1864–70 was resident secretary at Franklin Institute, where he continued his lectures. In 1867 he was appointed professor of chemistry at the University of Pennsylvania, and in the same year became editor of the Franklin Institute *Journal*. He conducted the photographic branch of the United States eclipse expedition to Iowa in 1869, and in additon to securing several excellent photographs of the eclipse, proved that the bright line of the sun's disc adjacent to the moon is due to a chemical action in the process of developing the plate and not to diffraction as had hitherto been held by the best scientists. In 1870 he was chosen president of the newly-founded Stevens Institute of Technology, and under his direction the faculty was selected and the course of instruction formed. His management of the institute made it one of the leading technological schools of the country; he gave it the benefit not only of his great learning but also several munificent gifts in the establishment and endowment of various necessary departments. His reputation as a scientist became world-wide and his services as a chemical expert were eagerly sought in litigation. From 1878–85 he was a member of the United States Lighthouse Board and in 1876–81 he was president of the American Chemical Society. Besides writing numerous papers on electricity and fluorescence, he assisted in the preparation of ‹The Student's Practical Chemistry› (1868).

MORTON, James Douglas, 4th earl of, regent of Scotland: b. Dalkeith, Scotland, about 1530; d. Edinburgh, 3 June 1581. He married a daughter of the third earl and succeeded to the earldom on the death of his father-in-law, in 1553. He became Lord High-Chancellor of Scotland 10 years later, but fled to England in 1556 on account of his share in the murder of Rizzio. He was soon pardoned and on Bothwell's abduction of Queen Mary joined the confederated lords against him. He stood sponsor for James VI at his coronation, and led the van at the battle of Langside (1568). He again became one of the leading opponents of Bothwell; was chancellor, and in 1572 regent of the kingdom. Having made himself many enemies by maladministration, he resigned, but recovered authority not long after. His enemies, however, at length proving too strong for him, he was charged as accessory to the murder of Darnley, tried, condemned and beheaded by the decapitating instrument he himself had introduced into Scotland.

MORTON, James St. Clair, American soldier: b. Philadelphia, Pa., 24 Sept. 1829; d. Petersburg, Va., 17 June 1864. He was graduated from West Point in 1851, was appointed to the engineering corps and in 1855–57 was assistant professor of engineering there. He was in charge of the Chiriqui expedition in Central America in 1860, and later superintended the work on the Washington aqueduct. In 1861 he was in command of the fortification at Tortugas, and in May 1862 was appointed chief engineer of the Army of the Ohio. In October 1862 he was promoted brigadier-general and was transferred to the Army of the Cumberland as chief engineer in command of the bridge-brigade. He built the entrenchments around Murfreesboro, Tenn., and was engaged in the battles at Chattanooga and Chickamauga. He was chief engineer of the Ninth army corps in the Richmond campaign of 1864, and was killed in the battle of Petersburg. He published ‹An Essay on Instruction in Engineering› (1856); ‹Memoir on Fortification› (1858); ‹Life of Maj. John Saunders, of the Engineers› (1860), etc.

MORTON, John, English prelate: b. Milborne, Saint Andrew, Dorsetshire, England, about 1420; d. Knoll, Kent, 15 Sept. 1500. He studied at Balliol College, Oxford, and subsequently became principal of what is now Christ Church College. He adhered with great fidelity to Henry VI and the house of Lancaster, but nevertheless Edward IV made him master of the rolls and bishop of Ely (1478). Richard III imprisoned him, but he escaped to Flanders and under Henry VII became archbishop of Canterbury and chancellor (1486). It was he who suggested the union of the house of Lancaster and York by the marriage of Henry with Elizabeth of York, daughter of Edward IV. In 1493 he became a cardinal.

MORTON, John, one of the signers of the Declaration of Independence: b. Ridley, Delaware County, Pa., 1724; d. April 1777. After working for several years as a surveyor he began the practice of law. In 1764 he was elected to the general assembly of Pennsylvania, of which he became a conspicuous member, serving for a number of years and being speaker from 1772 to 1775. In 1765 he was a member of the Stamp Act congress; in 1766 became sheriff in his county, and was shortly afterward appointed one of the judges of the Supreme Court of Pennsylvania. He was always an earnest advocate of the rights of the colonies and warmly supported the Revolutionary War. In 1774 he was elected a delegate to the 1st Continental Congress, and was a member of that body till his death, taking active part in its debates and in the framing of the Articles of Confederation. He gave the casting vote of Pennsylvania in favor of the Declaration of Independence, the four other delegates present from that State being equally divided as to the measure, and affixed his signature to the Declaration.

MORTON, John Maddison, English dramatist: b. Pangbourne, 1811; d. 1891. He was educated in France, then held a clerkship in Chelsea Hospital, London (1832–40). In 1881 he became a Charterhouse brother when in sore need of a pension. He wrote farces, showing exceptional facility in the adaptation of French dialogues to suit English taste. While he was a prolific writer of plays little survives for recent presentation except his ever-popular ‹Box and Cox› (1847). Consult ‹Dictionary of National Biography,› Vol. XXXIX (London 1894).

MORTON, Julius Sterling, American agriculturist and statesman: b. Adams, N. Y., 22 April 1832; d. Lake Forest, Ill., 27 April 1902. He was graduated from Union College in 1854 and removed to Nebraska City in 1855, where he was editor of the Nebraska City *News*. In 1856–57 he was a member of the Territorial legislature, and in 1858 secretary of the Territory. Upon the resignation of Governor Richardson in 1858 he acted as governor, and in 1893–97 was Secretary of Agriculture under President Cleveland. He was the originator of Arbor Day and an active member of various agricultural and horticultural societies.

MORTON, Levi Parsons, American banker and politician: b. Shoreham, Vt., 16 May 1824; d. Rhinebeck, N. Y., 16 May 1920. In 1843 he established a mercantile business at Hanover, N. H.; in 1850 entered the banking business in Boston; and later removed to New York, where in 1863 he founded the large banking firm of Levi P. Morton & Company (later Morton, Bliss & Company), which assisted in floating the government war loan during the Civil War. He also established a branch of his firm in London, and the Morton Trust Company of New York, and gained a reputation as an able financier. He was elected to Congress on the Republican ticket in 1878 and served one term (till 1881); he was then appointed United States Minister to France, where he remained till 1885; in this capacity he secured legal status in France for American corporations. In 1888 he was elected Vice-President of the United States, and made an especially able presiding officer in the Senate. In 1894 he was elected governor of New York State, serving for one term; in the last year of administration he urged in a special message the abolition of the ward-trustee system of school government in New York city public schools, and signed the bill which enforced this reform. In 1896 he was New York State's candidate for the Presidency at the National Republican Convention. After retiring from public life he resumed his banking operations and became a director in several insurance companies.

MORTON, Nathaniel, American historian: b. Leyden, Holland, about 1613; d. Plymouth, Mass., 29 June 1685. He was of English descent, came with his father to Plymouth in 1623, became an inmate of Governor Bradford's family and his public assistant, and from 1645 until his death was secretary of the colony. In compliance with the request of the commissioners of the New England colonies, he compiled (1669) and published his principal work, ‹New England's Memorial, or a Brief Relation of the Most Remarkable and Memorable Passages of the Providence of God Manifested to the Planters of New England.› For nearly two centuries, or until Bradford's ‹History of Plymouth› was discovered in 1855, Morton's work was the principal authority on the matters it dealt with. He compiled it largely from Bradford's manuscripts and Edward Winslow's journals. ‹New England's Memorial› was several times reprinted in the American colonies, and was also reproduced in England. Besides various other works, Morton was also the author of ‹A Synopsis of the Church History of Plymouth› (1680).

MORTON, Oliver Perry, American statesman: b. Salisbury, Wayne County, Ind., 4 Aug. 1823; d. Indianapolis, 1 Nov. 1877. He studied law, was admitted to the bar in 1846, began the practice of his profession in Centreville, Ind., and became a circuit judge in 1852. He was an anti-slavery Democrat, but, after being read out of the party for his refusal to support the Kansas-Nebraska bill, became one of the leaders of the new Republican party, and was defeated as its candidate for governor in 1856. Four years subsequently he was elected lieutenant-governor, and when, in January 1861, Governor Lane was elected to the national Senate, Morton became governor. His active loyalty to the government did much to sustain the administration during the trying times of the Civil War. At its outbreak he at once sent troops to the field, but in the next year was greatly hindered in his efforts by a hostile legislature and subsequently by the efforts of a secret, disloyal society known as the Knights of the Golden Circle. Several plots at his assassination were hatched. Nevertheless he surmounted all obstacles, and his services to the nation were thankfully recognized by its chiefs. He was elected a United States senator from Indiana as a Republican in 1867, serving till 1877, and in the latter year was a member of the Electoral Commission. Consult ‹Life,› by Foulke (1899). After the close of the Civil War he had been stricken with paralysis in his lower limbs, but his intellectual powers rose above his physical disability, and he continued until his death one of the most eloquent, forceful and dominating figures in public life. The fact that he sometimes addressed the Senate standing supported by two canes earned for him the waggist sobriquet of the «Devil on Two Sticks.»

MORTON, Paul, American financier and politician: b. Detroit, 22 May 1857; d. New York, 1911. He attended the Nebraska public schools, and at the age of 16 started his commercial career as office boy in the land office of the Burlington and Missouri River Railroad, at Burlington, Iowa; after several promotions he entered the employ of the Chicago, Burlington and Quincy Railroad, rising from clerk to chief clerk, then successively assistant general freight agent, general passenger agent, and general freight agent. In 1890 he became vice-president of the Colorado Fuel & Iron Co., for six years, when he accepted the vice-presidency of the Atchison, Topeka and Santa Fé Railroad, greatly distinguishing himself in railroad and public affairs. He influenced great advances in the railroad system, and was a true friend and advocate of the rights of the employees in large corporations; also favored publicity as assisting in the work of the investing public and productive of honesty in management. Until 1896 he had been very stanchly Democratic but the «silver question» won him over to the Republican party. In 1904 he was appointed by President Roosevelt Secretary of the Navy, but he retired (1905) to become president of the Equitable Life Assurance Society of New York. He thoroughly reorganized the corporation's system and advanced to fruition many measures that brought about uniformity in tariffs and stability in executive departments of insurance. His death occurred suddenly and unexpectedly as he was, unaccompanied, passing between the different public offices in the course of business.

MORTON, Samuel George, American anatomist: b. Philadelphia, Pa., 26 Jan. 1799; d. there, 15 May 1851. He studied medicine at the University of Pennsylvania and in Edinburgh; began to practice in Philadelphia in 1824; was immediately prominent in the Academy of Natural Sciences being its secretary 1825 and its president 1850; became professor of anatomy in Pennsylvania College in 1839; and made special studies of ethnology, craniology and plant physiology. His valuable collection of skulls, numbering 1,500 specimens (900 human), led him to urge the diverse origin of the human race. He contributed to Silliman's *Journal,* and published ‹Crania Americana› (1839); ‹Crania Egyptica› (1844), and ‹Illustrated System of Human Anatomy› (1849). Consult ‹Life› by Meigs (1851).

MORTON, Thomas, English prelate: b. York, 1564; d. 1659. He studied at Saint John's College, Cambridge, receiving the degrees M.A. (1590), and D.D. (1606), becoming a Fellow and university lecturer in logic. He became one of the chaplains of James I and (1606) dean of Gloucester, was transferred (1609) to deanery of Winchester, to canonry of York (1610) and was made bishop of Chester in 1616. He was translated to Litchfield and Coventry (1618), in which fields he devoted his endeavors to win over the Nonconformists and recusants. In 1632 he was appointed to the see of Durham, holding the position canonically till his death, though Parliament decreed his deprivation in 1647. He had been impeached (1641) on the fall of Charles I, but was released after four months' imprisonment without trial, and was again imprisoned in 1645 because he refused to surrender the seal of Durham. After being driven (1648) from Durham House, London, he ultimately resided at Easton-Maudoit with Sir Christopher Yelverton. Most of his written works were devoted to exposure of Romish fallacies. His three most noted works are 'Apologia Catholica' (1605); 'Catholic Appeal' (1609); 'Causa Regia' (1620).

MORTON, Thomas, English colonist in America: b. England about 1575; d. Agamenticus (or Acomenticus), Me., 1646. He was an attorney of Clifford's Inn, London, of a somewhat doubtful reputation, and seems to have practised mainly in western England. In 1622 he landed in New England, where he remained three months; and in 1625 returned with Wollaston's Company. Wollaston soon after left for Virginia, and in the summer of 1626 Morton assumed control over those of Wollaston's following that remained. The settlement, Mount Wollaston (now Braintree, Mass.), near the coast, he called Mare Mount (Merry Mount); and in the spring of 1627 he erected a Maypole, and with the «salvages» proceeded to hold May-day to the scandalizing of their Puritan neighbors of Plymouth. Contrary to law, he supplied the Indians with firearms and instructed them in their use; and he was a rival of the Plymouth settlers in the fur-trade. He was accordingly arrested by Capt. Miles Standish and sent back to England (1628). But in August 1629 he was again in New England. In August or September 1630 he was a second time arrested and banished. He published, in 1637, 'New English Canaan,' which Nathaniel Morton ('New England's Memorial') denounces as «full of lies and slanders, and full fraught with profane calumnies,» but which as a satire is sometimes not unamusing, and contains information of interest regarding local features and the Indians. When he ventured back to New England (1643) he was imprisoned for about a year while evidence for a libel suit was being collected, and was finally let go on payment of a fine of $500. Nathaniel Hawthorne's 'The Maypole of Merry Mount' (in 'Twice-Told Tales,' 1837) and J. L. Motley's 'Merry Mount' (1849) are based on Morton's career.

MORTON, William James, American physician: b. Boston, 3 July 1845. He is a son of W. T. G. Morton (q.v.), whose name is connected with the first anæsthetic use of ether. He was educated at the Boston Latin School, Harvard University and Vienna. On his graduation there, in 1872, his thesis on «Anæsthetics,» gained him the Boylston prize. He practised medicine at Bar Harbor, Me., and in Boston; went to Kimberley, South Africa, where, besides practising his profession, he engaged in diamond-mining. Settling in New York he became editor of the *Journal of Nervous and Mental Diseases;* from 1882–85 was adjunct professor of nervous diseases at the New York Post-Graduate Medical School; served as neurologist to the New York Infant Asylum, 1887–90; and was afterward professor of nervous diseases and electrotherapeutics at the New York Post-Graduate School. As an authority in electrotherapeutics he has won wide recognition, and by his mechanical device for establishing the «static induced current» of electricity — the «Morton current» of the scientific world — has supplied a means for producing the X-ray, and rendered a service of great practical value to medicine and surgery. Indicted in January 1912, in association with Julian Hawthorne and others, on a charge of fraudulent use of the mails in the promotion of bogus mining companies, conviction followed nearly a year after; he was sentenced to 12 months' imprisonment, but was released in October 1913, pardoned by the President and reinstated in his profession.

MORTON, William Thomas Green, American dental surgeon: b. Charlton, Mass., 19 Aug. 1819; d. New York, 15 July 1868. He established himself in the practice of dentistry in Boston, and there in March 1844 became a student of medicine in the office of Dr. C. T. Jackson (q.v.), the scientist. In November 1846 he obtained a patent for the process of anæsthesia by what he called «letheon,» now known as ether. Jackson claimed the discovery of etherization previous to the winter of 1841–42, and Morton's patent was contested by both Jackson and Horace Wells, another of Jackson's pupils. Morton communicated his knowledge of the process to Dr. J. C. Warren, and anæsthesia by ether was made public through an operation performed by Warren at the Massachusetts General Hospital 16 Oct. 1846. The French Academy of Sciences investigated the matter and decreed a Montyon prize of 2,500 francs to Jackson for the discovery, and another of like amount to Morton for the application of the discovery to surgical operations. In 1852 a bill appropriating $100,000 as a national testimonial to Morton was introduced in Congress, but failed, as it did also in 1853 and 1854. Testimonials accrediting to him the application of ether as an anæsthetic were signed by the medical profession in Boston (1856), New York (1858) and Philadelphia (1860). Consult Weyman, 'Trials of a Public Benefactor' (1859).

MORTUARY CUSTOMS. See BURIAL; DEAD, DISPOSAL OF.

MORWITZ, môr'vĭts, **Edward,** German-American journalist: b. Dantzig, Prussia, 12 June 1815; d. Philadelphia, 13 Dec. 1893. After thorough training in the sciences and medicine at various German universities, he was graduated in 1840 from Berlin University, where he became an assistant physician and wrote 'The History of Medicine' (1848–49). In 1843 he practised his profession at Conitz, Prussia, but after the Revolution of 1848 settled in the United States. In 1853 he bought the German *Democrat* of Philadelphia and in 1855 issued a German political weekly, *The United States Journal,* followed in the same year by a German Sunday paper, *The New World.* He gave great support to the Union during the Civil War, and assisted in the raising of troops and the placing of government loans. In 1862 he took a leading part in establishing the German Press Association of Pennsylvania, and in 1870 organized the movement to raise funds for aiding German soldiers in the Franco-German War, about $600,000 being received for that purpose. He at one time owned or controlled about 300 newspapers, both German and English, and was a powerful factor in welding together the German population of the State.

He invented a breech-loading gun before leaving Germany.

MOSAIC, an imitation or reproduction of a painting or ornamental design, formed generally by means of pieces of opaque glass of different colors; also by colored stones (especially marbles and precious stones) placed side by side, and attached by being bedded in a cement. The art originated in the East, but received its perfection from the Greeks, and was thus conveyed to the Romans. In Italy many floors ornamented with mosaic work have been found among ancient ruins. Afterward, when the art was revived in Italy, the Venetian school becoming very celebrated, Clement VIII, in the 17th century, had the interior of the dome of Saint Peter's decorated with this kind of work. The art was largely employed for copying painting by famous artists, and thus rendering permanent their original freshness and beauty. The Roman school of mosaicists is still the most famous, though excellent works have been produced in recent times by Venetian and also by Russian artists. There is a studio for the production of mosaics in the Vatican at Rome. The most important works executed here in recent times are a series of portraits of the popes. In the most costly mosaics precious stones have been cut to furnish materials; but in common works of this art enamels of different colors, manufactured for the purpose, are the material employed. Roman enamels are made of small rods of opaque colored glass. In the first place cakes of glass are made of every variety of color and shade likely to be required. As many as 10,000 shades are said to be in use. These cakes are drawn out into rods thicker or thinner, according as they are to be used for finer or for coarser work, a great number being mere threads. They are kept in bundles, and arranged in sets corresponding to their colors. For a work of moderate size a piece of dark slate or marble is prepared by being hollowed out like a box and filled with plaster of Paris; upon this plaster the artist draws the design or pattern, and the workman proceeds with his work by removing small squares of the plaster, and filling in these with pieces cut from the glass rods, the pieces being fixed in their places by a cement. Gradually, in this manner, all the plaster is removed, and a picture is formed by the ends of the pieces of colored glass. It will easily be understood that this is a very slow process, and there are large pictures that have taken as many as from 12 to 20 years to produce. When mosaic pictures are to be viewed near at hand they are polished perfectly smooth with a flat stone and emery, and present a glossy surface similar to that of paintings in oil. When they are to be viewed at a distance the surface is left rough, when they present an appearance similar to pictures in fresco. Inlaid works, of agate and other costly stones, are executed on the same principle as mosaic, except that the stones are larger, and cut to the shape of different parts of the object to be represented. Works of this class are known as Florentine mosaics. Flowers and ornamental designs are the chief objects of this branch of the art. A mode has been invented of sawing the plate with the mosaic pictures into two or three sheets, and thus increasing the number of works produced at one time. Consult Barwell and Druitt, ‹Mosaics and Stained Glass› (New York 1909); Furnival, W. J., ‹Leadless Decorative Tiles› (Stone, Staffordshire, 1904).

MOSANDRIUM, or **MOSANDRUM** (from K. G. Mosander, a Swedish chemist), supposedly a new rare earth metal, whose oxide was thought to have been discovered in 1878 by Lawrence Smith, in specimens of the mineral samarskite obtained from North Carolina. It was afterward shown to be a complex substance containing terbium, samarium, dysprosium, traces of praseodymium and neodymium and probably gadolinium.

MOSASAURIA, an order of marine reptiles of the Upper Cretaceous Period, typical of the reptilian subclass *Pythonomorpha.* They were of world-wide distribution and their remains occur so plentifully in the western United States as well as in the Old World that their structure is thoroughly known. They were large predaceous marine lizards, resembling the modern monitors in many features, but reaching in many species the size of crocodiles — larger in some cases, but no skeletons are known indicating a greater length than 45 feet. They had four limbs with all the bones well developed but enclosed in a mitten of flesh and skin, forming paddles, which, with their great tails, must have made them powerful and agile swimmers. «Their cup-and-ball vertebræ indicate great flexibility of the body, their sharp teeth denote ability to capture slippery prey, and the structure of the lower jaw shows that they probably ate in a hurry and swallowed their food entire. . . . In the mosasaurs, as in the cormorants, among birds, there is a sort of joint in each half of the lower jaw, which permits it to bow outward when open; . . . if the reader will extend his arms at full length, the palms touching, and then bend his elbows outward, he will get a very good idea of the action of a mosasaur's jaw» — Lucas. The mosasaurs were of three types, namely, *Tylosaurinæ,* resembling gavials, with a long slender beak or exension of the snout beyond the teeth, and long paddles strengthened with numerous phalanges; *Platecarpinæ,* short-headed, very long-tailed reptiles, including *Platecarpus, Prognathosaurus, Brachysaurus* and some other genera; and *Mosasaurinæ.* The last were the typical mosasaurs, apparently the most completely marine and powerful and perfected of the race. The two genera are *Mosasaurus* and *Clidases.* None survived the close of the Cretaceous. Consult Zittell-Eastman, ‹Text-book of Paleontology› (1902), in which will be found detailed and illustrated descriptions of various forms, and many references to the literature of the subject.

MOSAYLIMA, mō-sā-lē'mä, or **MOSEILEMA,** Arab prophet and rival of Mohammed (q.v.): b. early in the latter half of the 6th century; d. 633. He seems to have been a prophet in the tribe of Bani Hanifah, in Nejd, before Mohammed arose; and his name Rahmân, «the merciful,» one of Mohammed's favorite titles for Allah, may be held proof that he claimed to be the Messiah. Tradition says that Mohammed scornfully refused Mosaylima's suggestion that they should share the spiritual leadership of the earth; but modern criticism makes it more probable that the Prophet compromised with him considerably, and it is even suggested that Mohammed wished to make him his successor by testament, but was prevented by his attendants as he was dying. A break between Abu Bekr, the caliph, and Mosaylima came speedily; perhaps Mosaylima even openly opposed Islam. At any rate in the 11th year of the Hegira, his forces though far superior in numbers were met and defeated by Khaled, the Sword of God.

MOSBY, mŏz'bĭ, **John Singleton,** American lawyer and soldier: b. Edgemont, Powhatan County, Va., 6 Dec. 1833; d. Washington, 30 May 1916. He was graduated at the University of Virginia (1852), admitted to the bar (1855) and was practising law at Bristol, Va., when the Civil War broke out. He enlisted as private in the Confederate army and was later promoted adjutant of the 1st Virginia Cavalry. In two months' time, however, he was reduced to the ranks. Mosby, undaunted, then offered his services as scout to Gen. James E. B. Stuart, and in that capacity guided Stuart's cavalry in a desperate raid on McClellan's army on the Chickahominy in June 1862. In 1863, after enduring a short captivity, he went to Richmond and recruited an independent body of fighters which soon became famous under the name of Mosby's Partisan Rangers. This small cavalry command, of which he was colonel, became a terror to the Union troops and did much damage in cutting off means of communication and destroying supply trains, capturing outposts, etc. They adopted a guerrilla style of warfare and operated through Virginia and Maryland. Subsequently his force was pressed into the regular Confederate army as the 43d battalion of Virginia cavalry, and served till the cessation of hostilities. His men were dispersed and concealed when not engaged in raiding, and he had in force a perfect system of reassembling them at the shortest notice. At Chantilly (16 March 1863) he defeated a much larger force than his own. Probably his most brilliant exploit was the capture of Brigadier-General Stoughton, United States army, at Fairfax Courthouse, in the same month. To accomplish this he made a raid inside the Federal lines. At Danesville (1 April 1863) he successfully defended himself against a force sent especially to capture him. He harassed the rear of Grant's army, in its advance on Fredericksburg, to such an extent that Grant was forced to send a special detail to protect his communications and supplies. One of Mosby's most important raids resulted in the capture of Sheridan's entire supply train, which he surprised near Berryville.

Mosby was commissioned captain in March 1863, major two weeks later and colonel some time after that. His regiment was disbanded 21 April 1865, and he again took up the practice of law, settling at Warrenton, Va.

Mosby became a Republican after the War and supported General Grant for the presidency. It is said he originated the phrase «the solid South.» He was United States consul to Hongkong 1878–85, afterward practised law in San Francisco, Cal., and was assistant in the Department of Justice at Washington 1904–10. He delivered a lecture in Boston, on Stuart's Cavalry, in December 1886, which was afterward published in book form and entitled ‹War Reminiscences› (1887). He also wrote ‹The Dawn of the Real South› (1901). Consult Crawford, ‹Mosby and His Men› (1867); Scott, J., ‹Partizan Life with Mosby› (1867); Williamson, ‹Mosby's Rangers› (1896).

MOSCHELES, Felix, British portrait painter: b. London, 8 Feb. 1833; d. Tunbridge Wells, January 1918. He was the son of Ignaz Moscheles, the distinguished pianist and composer, and the life-long friend of the great Mendelssohn. Felix was educated at King's College, London, and was then sent to Hamburg and Karlsruhe. His childhood was spent amid a circle of literary and artistic celebrities, including Mendelssohn, Joachim, Malibran, Lablache and Dante Gabriel Rossetti. In later years the list was extended by many of the most famous characters of the age. In 1846 his father migrated to Leipzig to take over the directorship of the Conservatoire. Here Felix was taught drawing and architecture. In 1850 he went to Paris to pursue his art studies, arriving in the days of the Republic which followed the flight of Louis Philippe, and he witnessed the *coup d'état* which placed Napoleon III on the throne. A lucky arrest brought Moscheles into touch with Mme. Achille Fould, whose husband was then at the head of affairs, and who was a friend of the Moscheles family. The young artist was introduced into the best circles of Parisian society. At the Atelier Gleyre, where he studied, he made the acquaintance of Du Maurier, afterward the famous *Punch* artist. Moscheles pursued his later studies in Antwerp, where Alma-Tadema, Maris, Neuhuys and Heyermans were his fellow-students. He afterward opened a studio and settled in London, where he and Du Maurier formed a merry circle with Poynter, Whistler, Stacy Marks and Charles Keene. In 1862 he painted a portrait of Mazzini, which after the latter's death he offered to the Italian nation, but the offer was refused. Moscheles had long been interested in the question of universal peace and international arbitration. He discussed this subject with President Cleveland during a visit to America in the '80's, when he crossed the Atlantic with Henry Irving, carrying an introduction from Robert Browning. He painted Cleveland's portrait and later one of Browning, which is now in the Armour Institute, Chicago. Among his works are studies of Gounod, Rubinstein and Sir H. M. Stanley. He exhibited in Antwerp, Paris and London, and published two volumes of autobiography, ‹In Bohemia with Du Maurier› and ‹Fragments of an Autobiography,› besides editing Mendelssohn's letters to his parents. He was president of the International Arbitration and Peace Association and of the London Esperanto Club.

MOSCHELES, Ignaz, German pianist and composer: b. Prague, 30 May 1794; d. Leipzig, 10 March 1870. Of Jewish parentage, studied under J. D. Weber, director of the Prague Conservatory of Music, and afterward under that of Albrechtsberger and Salieri, at Vienna. On the completion of his studies he made a successful professional tour in Germany, and in 1820 arrived at Paris, where he met with an exceptionally enthusiastic reception and afterward made tours of other continental capitals. In 1825 he settled in London, where he was professor of music at the Royal Academy for 21 years. Here he had Thalberg for a pupil, as he had formerly, in Berlin, had Mendelssohn. At the latter's request he went from London to Leipzig where he was professor of music in the conservatory there from 1846 till his death. Among his finest compositions may be mentioned his Concertos Nos. 3, 4 and 5, the Concertos Fantastique and Pathétique; his great Sextett and Trio; his Sonatas Caractéristique and Mélancclique; and his studies. Consult ‘Aus Moscheles Leben’ (1872); ‘Briefwechsel mit Mendelssohn-Bartholdy’ (1888).

MOSCHEROSCH, mō'shĕ-rŏsh, **Johann Michael,** German satirist: b. Willstädt, near Strassburg, 5 March 1601; d. 4 April 1669. He was a descendant of an Aragon (Spanish) family and studied at Strassburg, after a short stay in France was appointed (1626) master of the court for the Duke von Leiningen-Dachsburg, then acted as district magistrate (1630) for Count von Criechingen and (1635) for the young Protestant Duke Bogislav von Croy at Finstingen-on-Saar. Between war, looting, famine and pestilence life was a series of disasters. In 1643 he was transferred to Benfelden, then a Swedish fortification, as member of the council of war, to become secretary of state at Strassburg. In 1656 he was appointed counsellor of war and of the Church for the Duchy Hanau, next entering the service of the Elector of Mayence and, from 1664, under the Landgravine of Hesse. He was admitted to the Fruchtbringende Gesellschaft, in 1645, with the surname «Der Träumende» (the Dreaming One), his principal work ‘Wunderlichen und wahrhaftigen Gesichte (Visionen) Philanders von Sittewalt’ having been published in 1640 (revised editions, Strassburg 1642–43). It is clearly a keen satire of his times laid down on the lines of Quevado's ‘Sueños.’ Consult Nickel's ‘Mosch rosch als Pädagog’ (Leipzig 1883); Pariser, ‘Beiträge zu einer Biographie von Moscherosch’ (in *Münchener Dissertation* 1891): Martin, ‘Johann Michael Moscherosch’ (in *Jahrbuch der Gesellschaft für lothringische Geschichte und Altertumskunde*, Vol. III, Metz 1891).

MOSCHUS, mŏs'kŭs, Greek bucolic poet of Syracuse in Sicily, flourished about 150 B.C. Four idyls form the whole of the remains of Moschus, which exhibit great elegance of style and delicacy of conception. The Επιτάφιος βίωνος (‘Lament for Bion’) was imitated by Shelley in ‘Adonais.’ A translation by J. M. Edmonds was published in 1912. The works of Moschus have commonly been edited with those of Bion (q.v.) and Theocritus (q.v.), and the three have been well translated by Andrew Lang (1889). See Theocritus, Bion and Moshus, Idyls of.

MOSCOSO DE ALVARADO, Luis de, loo-ēs' mōs-kō'sō dā äl-vä-rä'dō, Spanish adventurer: b. Badajoz, Spain, about 1505; d. Peru, about 1560. He served under his kinsman Pedro de Alvarado in his expedition to Guatemala in 1529 and in 1534 accompanied him to Peru where he was for two years a follower of Pizarro, and then returned to Spain to live in luxury for several years on the proceeds of his services. In 1538 he attached himself to De Soto's expedition to Florida and upon the latter's death in 1542 took command and after many hardships succeeded in returning to Mexico. He was honored by the viceroy, Mendoza, and in 1551 accompanied him to Peru where he was entrusted with important commands until his death.

MOSCOW, Idaho, town, county-seat of Latah County, on the Northern Pacific, Oregon and Navigation Company's railways, about 95 miles south by east of Spokane, Wash. The chief industries of the country around Moscow are lumbering, farming, stock-raising, mining and fruit-growing. Considerable grain and vegetables are raised. The chief manufactures of the town are lumber, flour and machine-shop products. The University of Idaho and the State Agricultural College are located in Moscow. Pop. 3,956.

MOSCOW, Russia, capital of the Soviet Republic since 14 March 1918, and from Peter the Great to Nicholas II the second capital of the old Empire, situated in a highly cultivated district on the Moskva, 400 miles direct by rail southeast of Petrograd. It is the capital of a government of the same name (area, 12,847 acres; pop. 3,662,900), and was especially esteemed by the Russians as the place of the coronation of the tsars, the favorite residence of many of the nobility, the commercial emporium of central Russia and western Asia, and a principal seat of Russian manufactures. It is the holy or white mother city in the creed of the people, and no tsar would omit visiting it at least twice a year, or presenting in the city his eldest son after he has reached his majority.

As a general rule the temperature ranges from a winter mean of 14° F. to a summer mean of 66°, the annual mean being 40°. Sections of the city are walled. A considerable portion of the enclosed space is unoccupied by buildings, has an undulating surface and is traversed by the navigable Moskva, which is crossed by five bridges, and entering at the middle of the west wall makes a series of serpentine windings, in the course of which it receives the Iaousa and the Neglina, and leaves the city at the southeast corner. The river is frozen for five months of the year. The general view of the town, as seen from Sparrow Hill, an eminence on the southeast, is peculiarly striking and picturesque. Its hundreds of churches and convents, surmounted by gilt and variously colored domes and spires, its imperial and other palaces, its boulevards, gardens, ponds and, above all, the high walls and numerous stately towers of the Kremlin or citadel, produce an effect unequaled by any other European city. It formerly comprised five principal divisions: the Kremlin, Kitaigorod, Byeloigorod, Semlyanigorod and the Sloboden or suburbs.

Public Buildings, etc.— The Kremlin, situated on the north bank of the river, forms the centre of the town, and in it are found the principal civil and ecclesiastical buildings. The Kremlin has always been held in almost superstitious veneration by all Russians. «Above Moscow there is nothing but the Kremlin; above the Kremlin, nothing but the sky.» Here in the first place is to be seen the Great Palace, a lofty building in a mixed style of architecture, erected in 1838–49, having the Treasury, forming a sort of wing, on the right, while also connected with it is the Terem or old palace of the tsars, belonging to the 16th and 17th centuries. The Cathedral Square, on the summit of the Kremlin, contains the Uspenskiy Cathedral (cathedral of the Assumption), in which the emperors are crowned, built in 1475–79, a clumsy building with heavy pillars, which support five cupolas, these, like the walls, glittering with grotesque frescoes of sacred subjects, painted on a golden ground; another cathedral here is the Archangelskiy Cathedral (of the Archangel Michael), founded in 1333 and rebuilt in 1505–09, containing the tombs of many tsars down to Peter the Great; a third is the Blagovieshchenski Cathedral (of the Annunciation), founded in 1397. The arsenal is an immense building lining one side of the northern angle of the Kremlin, the opposite side being occupied by the senate. The chief attraction is the upper story of the treasury, containing the crowns of the early tsars, several thrones, warlike trophies and miscellaneous curiosities; the arsenal contains an immense quantity of weapons and arms, the cannon taken from the French during their retreat and numerous other military trophies. Near the centre of the buildings of the Kremlin is the tower of Ivan the Great, which rises to the height of 322 feet, contains numerous bells and is surmounted by a gilded dome, on which the cross is displayed above the crescent. The great Tsar Kolokol, or king of bells, the largest in the world, stands at the bottom of the tower on a granite pedestal, to which it was raised in 1832, after having remained for more than a century buried on the spot where it had fallen while an attempt was being made to hoist it. The Kremlin also contains a bronze statue of Alexander II (1898). Outside of it the chief buildings are the cathedral of Saint Vassili (Saint Basil), one of the strangest specimens of architecture anywhere to be met with, having no less than 20 gilded and painted domes and towers, all of different shapes and sizes; and the temple of the Saviour, built (completed 1883) to commemorate the French retreat, at a cost of $10,000,000, and which is regarded as the most beautiful church in Russia. Other buildings worthy of notice are the great riding school, the Gostinnoi Dvor or principal bazaar in the Kitaigorod, a colossal building of three stories, where the leading wholesale merchants carry on their business; the Riadi, in the same quarter, occupied by handsome shops. Among the principal educational establishments is the university, the largest in the country, founded in 1755 by the Empress Elisabeth; it consists of four faculties, is attended by nearly 10,000 students and has a library of about 400,000 volumes, an observatory and botanical garden. A popular university, bearing the name of its founder, Gen. Alphonse Shaviavsky, was opened in 1908. The gallery of art contains 2,000 pictures, mainly Russian, bequeathed by the brothers Tretiaka. There are several good museums, the largest and most important being the Rumiantzof, in a fine building, with library and reading-room. The foundling hospital, in which children are received without questions being asked, supports annually 5,000 children, 1,500 being in the institution at one time. The number of the open and planted spaces throughout the city is great, but otherwise the streets are narrow, uneven and crooked, lined by mean-looking brick and wood houses. Beside the imperial palaces in the Kremlin are the Petrofskoi Palace and gardens outside of the Saint Petersburg gate, the principal fashionable resort during the summer season, and the palace of the Empress Elisabeth; and among the favorite pleasure grounds are the beautiful gardens of the Kremlin and the Galitzin garden on Sparrow Hill. Moscow is the residence of two archbishops and of the governor-general of the province.

Manufactures, Commerce, Communications.— Moscow is the second manufacturing city in the empire, and of late years its industrial and commercial activity has greatly increased. The manufacturing establishments give employment to more than 125,000 workmen and annually turn out goods to the value of about $150,000,000. The principal establishments are for textile fabrics, chiefly cotton, woolen and silk, besides manufactures of metals, railway trucks, looms, fibrine, paper, leather and other articles. The enamelware industry owes its beginning to an American, Henry Hiller. The machinery employed in the factories is generally of the most improved description, and though partly made in the city largely comes from Britain and elsewhere. From its central position Moscow is the great entrepôt for the internal commerce of the empire and toward which six railway lines converge. Great facilities for this commerce are given by water communication, which extends on one side to the Baltic, on another to the Caspian and on a third to the Black Sea; and by the railways to Saint Petersburg, Yaroslav, Nijninovgorod, Siberia, etc. In winter the traffic over the snow in sledges is enormous. Tea, silk, indigo and cotton are important articles of trade.

Administration, etc.— Moscow is under the immediate charge of a general governor and a military governor. It is the seat of important civil and criminal courts, and of various superintending boards of police, manufactures, trade, etc.; and has a number of literary, scientific and other societies of different kinds. Pop. (1891) 822,397; (1897) 977,269, with suburbs 1,035,664; (1913) 1,817,100, nearly all Great Russians of the Orthodox Greek Church, males greatly preponderating.

History.— Moscow is said to have been founded in 1147 by George Dolgoruki, Prince of Kiev. Its nucleus was the Kremlin, which at first was nearly surrounded by a palisade, and formed an important military station. For a long time it continued to be a dependency of the principality of Vladimir; and in 1238, when Batou-Khan devastated Russia, it was sacked and burned. In 1293 it was again sacked, and the inhabitants were dragged away into slavery by Khan Nagai. Ivan Danilovitch of Vladimir took the title of grand prince of Moscow in the early part of the 14th century and from that time it remained the seat of government until early in the 18th, when the administration was transferred by Peter the Great to Petrograd. Moscow was plundered by the Lithuanians and the Tartars of Tamerlane in the latter part of the 14th century, and was nearly consumed by fire in 1536, in 1547 and again in 1571, when the Tartars set fire to the suburbs, a large part of the population perishing on that occasion. During the insurrections caused by the pseudo-Demetrius (1605–12), when the Poles and Cossacks took the city, it was again partly destroyed. In 1812 it was entered by the French under Marat on 14 September, and on the 15th by Napoleon, who took up his residence in the Terem Palace in the Kremlin. The city, deserted by its inhabitants, was set on fire by order of the governor, Count Rostoptschin, compelling Napoleon to leave on 19 October and to take his final departure on the 23d, and resulting in the disastrous retreat of the French army. The greater part of the city was then destroyed, notwithstanding the efforts of the French to stay the progress of the flames. It was rebuilt within a few years. The railway to Petrograd was opened in 1851. The chief of modern events are the coronations in 1856 of Alexander II and in 1896 of the late Nicholas II, at the latter ceremony 2,000 people being crushed to death, and hundreds injured, during the distribution of gifts. On 17 Feb. 1905 the Grand Duke Sergius was assassinated in the Kremlin, and there were revolutionary disturbances in that and the succeeding year. On 14 March 1918 the People's Commissioners (the new Russian Soviet Government) left Petrograd for Moscow, which thus became the centre and capital of the New Russia. Consult Wirt Gerrare, 'The Story of Moscow' (London 1900); Grove, H. M., 'Moscow' (New York 1912).

MOSEILIMA. See MOSAYLIMA.

MOSELEY, mōz'lĭ, **Edward Augustus,** American lawyer: b. Newburyport, Mass., 23 March 1846; d. Washington, D. C., 18 April 1911. He engaged for several years in both the East and West Indian trade. He then studied law, was admitted to the Massachusetts bar and was also a member of the State legislature for several terms. His chief interest was in the lessening of danger in railroad travel, and he became the leading authority in the United States on all measures or appliances for procuring the safety of railroad employees and travelers. Largely for this reason he was appointed secretary of the Interstate Commerce Commission at the time of its formation. His efforts in obtaining and enforcing the Safety-Appliance Law gained him testimonials from all the railroad men's organizations in the United States, and the formal thanks of the Commonwealth of Massachusetts. He published 'Arbitration as applied to Railways and their Employees'; 'Safety Appliances on Railroads'; 'One Hundred Years of Interstate Commerce Law' (1900); 'The Transportation Question as Affected by the Cullom Bill' (1900); 'Federal Supremacy' (1907).

MOSELEY, Henry, English mathematician: b. Newcastle-under-Lyme, 1801; d. Bristol, 1872. He was graduated at Saint John's College, Cambridge, and after studying theology was ordained a priest of the Church of England. From 1831–44 he was professor of natural and experimental philosophy and astronomy at King's College, London, and was one of the first inspectors of schools to be appointed (1844). He was appointed canon of Bristol in 1853, next becoming chaplain to the queen. He was given the degree LL.D., *hon. causa*, Cambridge, 1870. Among his best-known works are 'A Treatise on Mechanics, Applied to the Arts' (1834); 'Astro-Theology' (1838; 3d ed., 1860); 'Lectures on Astronomy' (1839; 4th ed., 1854); 'The Mechanical Principles of Engineering and Architecture' (1843), much in use to this day as a textbook and frequently re-edited and revised.

MOSELLE, mō-zĕl (German, *Mosel*), a European river which rises in France at a point over 2,400 feet high on the western side of the Vosges and close to the old German boundary. After flowing northwest, through the department of Meurthe-et-Moselle, it proceeds northeast through Lorraine into Rhenish Prussia. After passing Trèves in a remarkably winding course, it falls into the Rhine at Coblenz; total course, about 314 miles. It is navigable from its junction with the Meurthe. Its principal affluents are, in France, the Valogne, Meurthe, Seille, Madon, Math and Orne, and beyond France, the Sarre, which joins it above Trèves; and the Sure, Kill and Elz. Of these affluents the Meurthe, Sure and Sarre are navigable. The fortress of Metz protects the valley of the Moselle, which forms the natural line of communication between France and Germany. The valley is famous for its fertility; the lower part for its vineyards. In the early days of the Great War in the fall of 1914, the German army of the Moselle took part in the attempted march on Paris.

MOSELY COMMISSIONS, two delegations known as the INDUSTRIAL and the EDUCATIONAL, which visited the United States in 1902 and 1903 to study conditions and methods in their respective branches, for comparison with those of Great Britain.

The Mosely Industrial Commission made a tour of the United States from November 1902 to January 1903, to investigate manufacturing, industrial and commercial lines, which in international competition had seriously affected the commerce and free trade policy of Great Britain. It was financed by Mr. Alfred Mosely (b. Bristol, England, 1855), a diamond merchant whose relations with American mining and other engineers in South Africa had developed the desire to discover the sources of their success, the comparative causes of Great Britain's industrial decline, and to evolve a plan whereby American methods could be introduced into the United Kingdom for the rehabilitation of its economic and industrial status. A suggestion to invite British trade-unions to select a representative from each to form a commission to study American industries and the condition of the workmen was acted upon, most of the unions electing as representative their general secretary. Twenty-three formed the commission and were given a free trip to the States, with expenses paid for nearly three months. Each man was pledged to study conditions carefully and to answer fully on his return a series of tabulated questions.

Mr. Mosely and the delegates made a circular tour in which they were afforded every opportunity to inspect some of the largest manufactories in the United States. They visited Niagara, Buffalo, Cleveland, Chicago, Dayton, Pittsburgh, Philadelphia and New York, as one party, while individual members also took trips to other points. The chief results of their observations were published in the 'Reports of the Mosely Industrial Commission' (London, April 1903).

Some of the conclusions arrived at were: The American workman for two and one-half days' work receives renumeration equal to that of the British for a week; the American is more temperate than the British; he lives longer; is more thrifty, and after a few years frequently retires with his savings to an easier occupation, usually farming or market-gardening. Labor saving machines were more in evidence in America than in the United Kingdom, but, there was a considerable difference of opinion among the various delegates as to what could be learned from America in their respective trades, for instance, the shipbuilding and bricklaying in England were considered superior to those of America. To the question «Are there greater opportunities for the workingman to rise in America than in England?» «Yes,» came as a unanimous answer. The average workman was considered as good in one country as the other, the difference was to be found in conditions. In Great Britain generations of workers toil in a confined area, and have become hidebound by inherited labor traditions; increased production to them does not mean increased wages — hence a lack of incentive. In the United States, the stimulating climate and abundance of undeveloped resources tend to a constant striving for direct results through the simplest means, whence the wonderful development of machinery, manufacturing equipment, output, increased wages, general prosperity and well-being of the American workmen, together with a unity of feeling between employers and employees along the lines of increased production, which is not to be found in England. The organization of capital and labor in the United States produced a great impression on the delegates, and the advantages of the Civic Federation to bring together these two great and active factors in production on all disputed questions, and at the initial stages to avert strikes by arbitration, were fully recognized as those of a model organization worthy of immediate adoption. The freedom accorded to religious belief and the excellent public school education of the States elicited the warmest praise from the commission, the advantage given to all the American youth being fully apparent.

The success of the Industrial Commission led to the organization of the *Mosely Educational Commission* to the United States, October–December 1903, in which 26 prominent British educators took part at the invitation of Mr. Mosely to investigate:

1. The development of individuality in the primary schools.
2. The social and intellectual effects of the wide distribution of secondary education.
3. The effect of specific instruction given (a) in business methods; (b) in applied science.
4. The present state of opinion as to the value of professional and technical instruction of university rank, designed with special reference to the tasks of business life.

As in the work of the Industrial Commission the conclusive deductions drawn were wholly in favor of the system of education in the United States which was described as practical, enlarged, enlightened, up-to-date and scientific. Consult Mosely, ‹Reports of the Mosely Educational Commission to the United States of America, October–November 1903› (London 1904).

C. Leonard-Stuart,
Editorial Staff of The Americana.

MOSEN, mō'zĕn, **Julius,** German poet: b. Marieeney, in Vogtland, Saxony, 8 July 1803; d. Oldenburg, 10 Oct. 1867. He was educated in the Plauen Gymnasium, studied law (1822) at Jena, travelled through Italy and then worked for some time under an attorney at Markneukirchen. In 1834 he settled at Dresden, taking up the practice of law, and soon becoming noted as an author. He became (1844) dramaturgist at the Oldenburg Hoftheatre, but incurable sickness greatly deterred his activities after 1848 and he was pensioned in 1850. He first came into prominence through his epic poem ‹Das Lied vom Ritter Wahn› (Leipzig 1831), a very ancient Italian legend redressed in a liberal form. His ‹Ahasver› (Dresden 1838) contains more of philosophy than poetry; but in his ‹Gedichten› (Leipzig 1836; 2d ed., 1843) he shows national radiance in a string of ballads as ‹Die letzten zehn vom vierten Regiment,› ‹Andreas Hofer,› ‹Der Trompeter an der Katzbach,› etc. In narrative form we have the novelle ‹Georg Benlot› (Leipzig 1831), ‹Bilder im Moose› (ib. 1846). His great ambition was centred in dramatical writing, but these works are too saturated in abstract rhetoric. Of his best might be mentioned ‹Cola Rienzi,› ‹Die Bräute von Florenz,› ‹Wendelin und Helene,› ‹Kaiser Otto III,› all of which are to be found in *Theater* (Stuttgart 1842), the latter being the most imposing. His talented work, ‹Die Dresdener Gemäldegalerie› (Dresden 1844), should also be quoted. His works in eight volumes has been published under the title ‹Sämtliche Werke› (Oldenburg 1863) and a fuller edition, including biography, was published in six volumes by his son (Leipzig 1880). Consult his ‹Errinerungen,› extended by Zschommler (Plauen 1893); ‹Julius Mosen, eine biographische Skizze› (Oldenburg 1870) is anonymous.

MOSENTHAL, mō'sĕn-täl, **Joseph,** German-American musician: b. Cassel, German, 30 Nov. 1834; d. New York, 6 Jan. 1896. He studied music in Germany and in 1853 removed to the United States where he was organist and choir director of Calvary Church, New York, 1860–87. He conducted the famous Mendelssohn Glee Club in New York in 1867–96 and played the violin in several leading orchestras there. He composed both church and secular music, among which are the psalm ‹The Earth is the Lord's› and part songs for ‹Thanatopsis,› ‹Music of the Sea,› ‹Blest Pair of Sirens,› etc.

MOSENTHAL, Salomon Hermann von, German dramatist: b. Cassel, 14 Jan. 1821; d. Vienna, 18 Feb. 1877. He studied at the University of Marburg and in 1851 obtained a position under the Austrian government. His best-known dramas are ‹Deborah› (1850); the original of ‹Leah the Forsaken› and ‹Sonnenwendhof› (1856), which were translated into English, Danish, Hungarian and Italian. He wrote also ‹The German Actors› (1863); ‹The Mayor of Altenburen› (1868); ‹Maryna› (1871); the tragedies ‹Düweke› (1860); ‹Pietra› (1865), etc.

MOSER, mō'zĕr, **Gustav von**, German dramatist: b. Spandau, Prussia, 11 May 1825; d. 1903. He obtained a military education and after serving in the Prussian army resigned in 1856 to devote himself to literature. He produced more than 100 successful comedies and farcical comedies, sometimes in collaboration; several of his works have been well received in English translations. Among his plays may be named 'Das Stiftungsfest' (1873); 'Ultimo' (1873); 'Der Bibliothekar' (The Private Secretary) (1878); 'Der Veilschenfresser' (1876); 'Krieg im Frieden' (1880). A uniform edition of his plays was published 1873–94 in 22 volumes. Consult the biography by Hans von Moser (Weimar 1908).

MOSER, Johann Jakob, German jurist and publicist: b. Stuttgart, 18 Jan. 1701; d. there, 30 Sept. 1785. He received his education at the University of Tübingen; in 1720 became teacher of law there, and in 1729 was appointed to the full professorship. In 1736 he became a director of the university at Frankfort-on-the-Oder, but in 1739, having fallen into disfavor with Frederick William I, was compelled to resign. He then founded the academy at Hanau for the education of the young nobility in political science; and he suffered imprisonment for five years at the instance of the Duke of Württemberg, his patron. He is credited with being the first to publish a systematic account of European international law. He was a prolific writer, his books numbering over 500, the most important of which are 'Deutsches Staatsrecht' (53 vols., 1737–54, with additions of 2 vols. 1766–75, and 3 vols. 1781–82); 'Lebensgeschichte' (1783). Consult the biography by Wächter (Stuttgart 1885).

MOSER, Justus, German historian and humorous writer: b. Osnabrüch, 14 Dec. 1720; d. there, 8 Jan. 1794. He studied jurisprudence at Jena and Göttingen; in 1747 became attorney for the government, and for 25 years during the minority of Duke Frederick of York acted as his legal adviser, and was afterward appointed a judge. His most important work is 'Osnabrüchische Geschichte' (2 vols., 1768; 3d ed., 1820; Vol. III, edited by Herbert von Bar, 1824). Of his humorous writings perhaps the most striking is 'Harlekin,' in which he attacks hypocrites and pedants of all kinds. He also published some valuable essays on local topics entitled 'Patriotische Phantasien' (4 vols., 1774–86). An edition of his complete works was published by Abeken in 10 volumes (Berlin 1842–43).

MOSES. Hebrew leader and legislator, the story of whose life and work is given with such singular clearness and strength in the Pentateuch, is one of those rare names that have stamped themselves permanently on the world's history, so that we turn again and again to the simple record of his career and achievements with an interest that never lags. With all his Oriental background and the fact that his concern was primarily with his own race to lead them from bondage to freedom, there is so much breadth and suggestiveness in the laws that bear his name, his moral statutes being at the basis of modern civilization, although promulgated 3,000 years ago, that he continues a familiar and fascinating figure to all eyes.

Traditional Data.— The Biblical account, with its rapid, stirring recital, which attains at times a kind of dramatic effectiveness, tells of his birth, how his mother, in dread of Pharoah's mandate which consigned all Hebrew children to be thrown into the Nile, concealed him for three months, then set him in an ark of bulrushes on the river's banks, where Pharoah's daughter discovered him and had him reared as her son (Ex. xi, 1–10). His days of ease were not to last. Not all of Egypt's luxurious life and his own hopes of future power as possible occupant of the throne could dull his innate racial sense of duty. Seeing an Egyptian attacking a Hebrew, he interferes and slays the aggressor, hiding the body in the sand. Then the next day he sees two Hebrews quarreling, and when he tries to separate them, one taunts him with slaying the Egyptian. In fear of further discovery and of death by Pharoah, he escapes to the peninsula of Sinai, dwelling with the priest of Midian, whose daughter he marries. Then follow 40 years as a shepherd, when occurred the episode of the burning bush on Mount Horeb. Now began his mission — it was his task, divinely appointed, to return to Egypt and redeem his brethren from slavery (Ex. iv, 1–9, 20). How he was met and aided by his brother Aaron, how he gained a hearing with his brethren, how Pharoah's heart was hardened against the departure of the Hebrews, until, after a series of successive plagues, the Egyptians in their terror bade the Israelites make every haste to leave, are steps in a thrilling drama that has served as material for preacher, poet and playwright, with its incidents to-day as fresh as when first read or narrated. Now began the long 40 years' march, but the Israelites had not advanced very far, they moved slowly, being accompanied by their wives and children, their flocks and herds, when Pharoah and his army started in pursuit (Ex. xiv, 8–9). How the panic and despair of the people are changed to exultation as the waters recede and Pharoah's hosts are drowned in the Red Sea, while the wanderers are saved, is another of those thrilling episodes immortalized in Miriam's Song of Triumph, that belongs to the highest strains of Hebrew poetry. Then the people are led by Moses through the wilderness to Sinai or Horeb, where he received the Ten Commandments and the Law and God enters into a covenant with Israel (Ex. xix et seq.). After this culminating incident, so vividly related, Moses continues his leadership and amplifies his message from Sinai with many details as to the tabernacle, the priests, the encampments. Cautiously now he marches forward to Kadesh, from which place the spies or scouts were sent to Canaan, the ultima thule of the people's journeyings. How characteristic — they refuse to advance in their alarm at the report of the spies, and were condemned to remain in the desert until that generation had passed away (Num. xiii–xiv). Nothing is extenuated in the flaming record — every act of weakness, of rebellion, of disobedience with its invariable penalty, all are frankly and unflatteringly told. Moses resumes the march eastward, making friends and foes on the journey, but receives warning that he will not be allowed to lead the people across the Jordan as he would die on the eastern side

(Num. xii). He gathers the tribes in consequence and gives them a farewell address, which is embodied in the book of Deuteronomy. He repeats the Law, adds his wise counsel, warns of the consequences of disloyalty and adjures the people to be faithful with an eloquence and persuasiveness that give his words perennial force. Then after a final blessing of the multitude, he ascends Mount Nebo to the summit of Pisgah, and dies in his 120th year. The place of his sepulchre is unknown (Deut. xxxiv), doubtless for good reasons as one familiar with the history of similar founders of religions can readily understand.

Character of the Laws.—The open pages of the Pentateuch relate the character of the laws of Moses with a minuteness of detail that leaves little, if anything, untold. The code, embracing 613 statutes, covers the entire requirements of priesthood, community and individual. While his training and early life in Egypt influenced in many ways his legislation, the distinctive features are vital, with their emphasis on a purer and more rational divine belief and their elements of a democracy after which later nations in certain respects have modeled their systems. Despite the elaborate forms of priesthood and sacrifices, concessions to a people not ready for a loftier attitude, from our 20th century point of view, although our later day civilization still needs balance wheels, and holds fast to signs, symbols, forms, ceremonies of its own, the essential truths of the Mosaic laws, its insistence on personal equality and personal morality, cannot be outgrown. Its spirit of broad humanity, its consideration for the old and the young, the slave and the enemy, the fruit tree and the animal creation, its health and food regulations full of suggestions to the modern physician and dietitian, all these show a wisdom in their author that accounts for his fame and the fact that so many of the Mosaic laws are still observed by the great majority of the people to whose ancestors the code was given.

Moses in the Legends.— It was to be expected that in course of time legends should arise as to the character of Moses and the various episodes in his career. In rabbinical literature, these have assumed a variety, a grandeur and a poetical beauty that account for their hold on the imagination for centuries to our day. To the average English reader Rev. S. Baring Gould's ‹Legends of the Patriarchs and Prophets› will be found stimulating. Dr. Ginzberg's ‹Legends of the Jews,› with its exhaustive chapters, will satisfy the more critical reader, although there is no attempt to elaborate the stories which are narrated with sober exactness. If it was denied the people to know his sepulchre and render him worthy post mortem honors, they had full license to draw upon their imagination and adorn the memory of so great a prophet, leader and law-maker by spinning the web of fairy tales in apt Orental fashion so dear to the Semitic mind and in which the Occidental no less delights even if he assumes a more worldly-wise air. These legends stretch over his entire history from birth to death and seek to interpret in their own imaginative way, which is often far from being forced or unnatural, the scenes and incidents that he encounters, which so readily adapt themselves to the story-teller's mood as well as to the teacher's vision. It is not necessary in the limited space at command to dwell at any length on the mass of legends so quotable and stimulating. The Hellenistic stories of Moses, if more limited, have a quaint interest of their own. The Mohammedan are obviously distortions or exaggerations of the rabbinical, although occasionally the treatment is original. Moses plays a part, too, in apocalyptic literature.

Modern Critical View.— Since Astrue in 1753 published his view of the composite character of the book of Genesis, due, as he stated, to the use by Moses of certain documents in its elaboration, the critics have waged a long continued battle as to the question of authorship, which has its piquant features and is still being contested almost as hotly as a century ago. The fact, too, that a parallel to the story of the birth of Moses and his experience in the bulrushes of the Nile is found in the cuneiform library of Assurbanipal and told of Sargon, a Babylonian king who ruled, it is said, about 3800 B.C., is not without its suggestions. The etymology of the name Moses, too, has given rise to much speculation, although the Biblical account has still its doughty defenders. However, whatever the criticisms as to name, authorship, date, whatever the differences in details, the prevalent opinion as to the man himself is one and the same, as a great historical figure, who added unity and strength to a nation, after setting it free, and under Providence, shaped its destinies and gave it the essentials of a religious and civil code of laws, which later ages developed. The verdict of the great majority of scholars from Wellhausen to Kittel, from Budde to McCurdy, from Cornill to Barton and Paton, is conclusive. Just as the story of the Exodus has been confirmed by modern investigation step by step on the long journey across the Desert, so the historical character of Moses stands out in clear relief after the fullest and most exacting analysis and research by the modern scholar and critic.

Bibliography.— Driver, ‹Introduction to Literature of the Old Testament› (New York 1897); Ginzberg, ‹Legends of the Jews› (Vols. II and III, Philadelphia 1909–13); Ottley, ‹A Short History of the Hebrews› (Chap. III, New York 1901); Warrington, George, ‹When was the Pentateuch Written?› (London and New York).

Abram S. Isaacs.

MOSES, Bernard, American historian and political economist: b. Burlington, Conn., 27 Aug. 1846. After graduating from the University of Michigan in 1870, he went to Europe for further study, receiving his Ph.D. from Heidelberg in 1873. In 1875 he became professor of history at Albion College, but since 1876 has been professor of history and political economy at the University of California. His more important works are ‹Politics› (with W. W. Crane); ‹Federal Government in Switzerland›; ‹Democracy and Social Growth in America›; ‹Establishment of Spanish Rule in America› (1898); ‹The Spanish Dependencies in South America› (1914); ‹The Government of the United States› (1906). The volume on ‹South America on the Eve of Emancipation› (1908) was later rewritten and embodied in the larger work on the Spanish dependencies. In March

1900 he was appointed a member of the United States Philippine Commission, and served in this capacity three years in the Philippine Islands. In 1908 he was a delegate from the United States government to the Pan-American Scientific Congress held in Santiago de Chile; in 1910 he was delegate to the International Conference of American States at Buenos Aires; and in the same year he was Envoy Extraordinary and Minister Plenipotentiary on special mission to Chile in connection with the centenary celebration of that country.

MOSES, George Higgins, American diplomat and public official: b. Lubec, Me., 9 Feb. 1869. He was graduated at Dartmouth College in 1890 and since 1898 has been president of *the Monitor and Statesman* Company of Concord, N. H. In 1890–91 he was secretary to the governor of New Hampshire, and from 1893 to 1906 was secretary of the State Forestry Commission. Mr. Moses was a member of the Concord board of education in 1902–03, 1906–09 and after 1913. He was delegate-at-large to the Republican National Convention of 1908 and 1916. From April 1909 to November 1912 he was Envoy Extraordinary and Minister Plenipotentiary of the United States to Greece and Montenegro. In November 1918 Mr. Moses was elected United States senator to fill the unexpired term of two years, occasioned by the death of Senator J. H. Gallinger, defeating John B. Jamison, Democrat, by a majority of 998.

MOSHEIM, Johann Lorenz von, yō'hän lō'rĕnts fŏn mōs'hīm, German Protestant theologian: b. Lübeck, 9 Oct. 1694; d. Göttingen, 9 Sept. 1755. He studied and taught at Kiel; became professor of theology at Helmstedt in 1723, abbot of Marienthal in 1726 and professor (1747) and university chancellor (1755) at Göttingen; was a notable preacher and an erudite theologian and church historian of liberal leanings; and wrote ‹Institutiones Historiæ Ecclesiasticæ (1755, translated into English by Maclaine); ‹Institutiones Historiæ Christianæ› (1763); ‹Attempt at an Impartial and Thorough History of Heresies› (1748–50); ‹Morals of the Holy Writ› (1770–78); etc.

MOSHER, mō'zhėr, **Eliza Maria,** American physician: b. Cayuga County, N. Y., 1846. She was graduated from the University of Michigan in 1875, and studied at the School of Medicine in Paris from 1879–80. She was resident physician at the Massachusetts Reformatory for Women in 1880–81 and director of the institution in 1881–83. In 1883 she went to Vassar College as professor of physiology and resident physician; from 1886–96, she was engaged in general medical practice in Brooklyn, N. Y., and then became professor of hygiene in the department of literature, science and arts, and women's dean at the University of Michigan, holding this position till 1902 when she returned to her practice in Brooklyn. She has been lecturer at the Chautauqua Summer School of Physical Education since 1888. She is the author of ‹Health and Happiness› (1911).

MOSKVA, mŏsk-vä, Russia, an affluent of the Oka, a tributary of the Volga, which rises in a marsh in the east of Smolensk, flows east to the city of Moscow and thence 112 miles southeast to the Oka, which it joins near Kolomna after a total course of 305 miles. It is connected with the Volga by the Moskva Canal. It is navigable from its mouth to Moscow except between November and April when it is frozen. The battle of Borodino or Moskva, between the French under Napoleon and the Russians under Kutusoff, was fought on its banks (7 Sept. 1812.)

MOSLEM, or **MUSLIM.** See MOHAMMEDANISM.

MOSLER, mōz'lėr, **Henry,** American artist: b. New York, 6 June 1841; d. 21 April 1920. A student of wood-engraving, he was draughtsman on a Cincinnati comic weekly (1885), studied with James H. Beard (1859–61), and was art correspondent for *Harper's Weekly* with the Army of the West 1862–63. Realizing the need of study he followed art at Düsseldorf and Paris (1863–66). Returning to Europe in 1874, he resided for many years in France, was appointed a Chevalier of the Legion of Honor in 1892 and was a successful exhibitor and prize winner at many exhibitions at home and abroad. His specialties are portraits, figure paintings and groups of figures.

MOSQUE, mŏsk (Arabic *mesjid,* Italian *moschea*), a Mohammedan house of prayer. The form of the oldest mosque was that of the Christian basilica, which however became modified in the progress of Mohammedan architecture. Mohammedans borrowed or adapted their ideas of architecture from the nations on whom they imposed their faith; the famous mosques of Turkey resemble the Byzantine architecture of Constantinople, and certain of those in India the temples of the Jains. Domes and minarets in course of time became emblematic of the more characteristic and ornate examples of Moresque or Saracenic art; but these are non-essentials, for in poor communities a bare whitewashed room may suffice for the public worship of the faithful. The mosques of the Arabs often include, in a quadrangular area, an immense number of columns ranged in files, the multiplicity and extent of which impress the mind of the beholder with surprise and admiration. These columns are, in numerous instances, the rich spoils of antique monuments. Mosque architecture possesses no fixed rules, deeming lightness and elegance alone to be the fundamental laws of architecture. In these Mohammedan churches we find neither altars, nor paintings, nor images, but a great quantity of lamps of various kinds, which form the principal interior ornament, and some sentences from the Koran written on the white walls. The buildings are often quadrangular in plan, and have an open interior court, where are fountains for ablutions. In the southeast of the building there is a pulpit for the imâm; in the direction in which Mecca lies (the *Kibléh*) there is a niche toward which the faithful look when they engage in prayer. Opposite the pulpit there is a platform surrounded by a parapet, with a desk on which is placed the Koran for the purpose of reading to the congregation. On Fridays the five daily prayers, obligatory on the faithful every day, are recited in the mosque by the whole congregation, together with additional prayers. It is not customary for women to enter the mosques, and when they do they are placed separately from the males. The chief officer of the mosque is the *nadir,* under whom are two imáms, muezzins who call the people to prayer, etc. These in addition to their religious vocation generally pursue secular callings. It is usual to cover the floor of the mosque with carpets, but there are no seats. On entering a mosque, the faithful remove their shoes. The building is never closed; and while nothing could exceed the devotion of the congregation gåthered together in worship, at other times the mosques serve as convenient meeting-places, and in which wayfarers may accommodate themselves. They also serve as schools and seats of learning. Thousands of students are regularly in attendance at the most famous of these, the Azhar Mosque in Cairo. The mosques are maintained for the most part by endowments in land. The finest of the mosques of Constantinople and of the world is that of Saint Sophia, at one time a Christian church. In addition to schools, the imperial mosques have frequently hospitals and kitchens for cooking food for the poor.

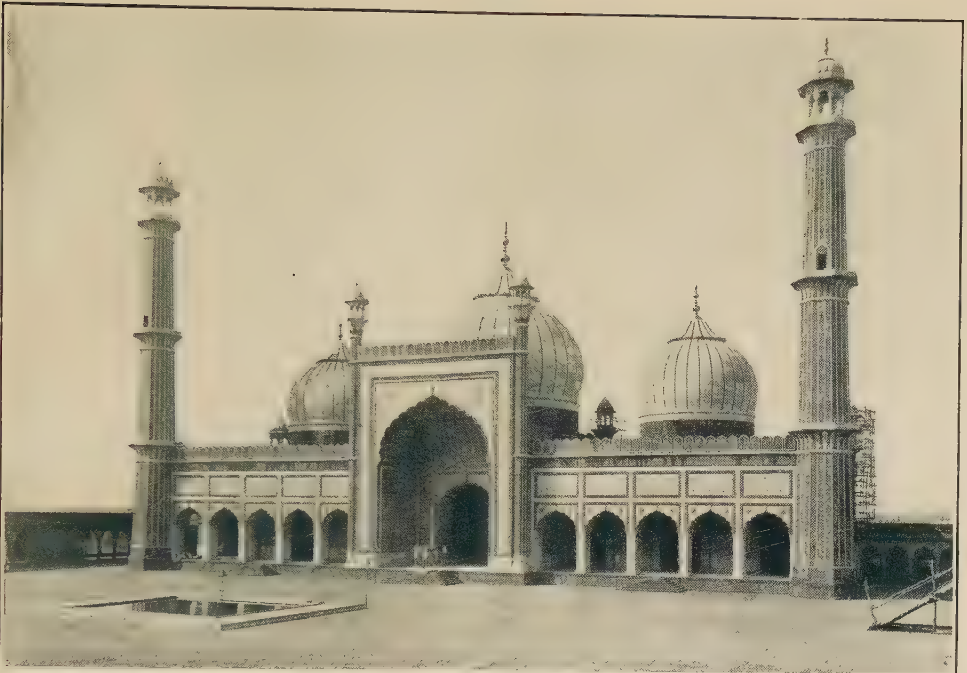
MOSQUERA Y ARBOLEDA, mōs-kā′rä ē är-bō-lā′dä, **Tomás Cipriano de,** Colombian politician and President: b. Popayan, 20 Sept. 1798; d. Coconuco, 7 Oct. 1878. After three years of service in the patriot army he was captured by the Spaniards, when he was only 18, but he escaped at Jamaica, returned to the army and in 1829 was made general by Bolivar, who made him also envoy to Peru. After Bolivar's death Mosquera traveled in North America and Europe. He became a senator in 1833; was President of New Granada 1845–49; in 1859 led the federalist revolt against Ospina, adopted a federal constitution by which the name of the country was changed from New Granada to the United States of Colombia, and became dictator of the new federation. His power was checked by a revolt led by Canal, with whom Mosquera in 1862 came to terms. Under the constitution then adopted Mosquera was elected President in 1863 and in 1866; the latter term was cut short by a successful revolution due to the President's arbitrary use of power. He was banished to Lima for four years, but upon his return again entered politics, was governor of Cauca and became a member of Congress. He was strongly anti-clerical; and wrote on the geography of New Granada, and a valuable life of Bolivar (1853).

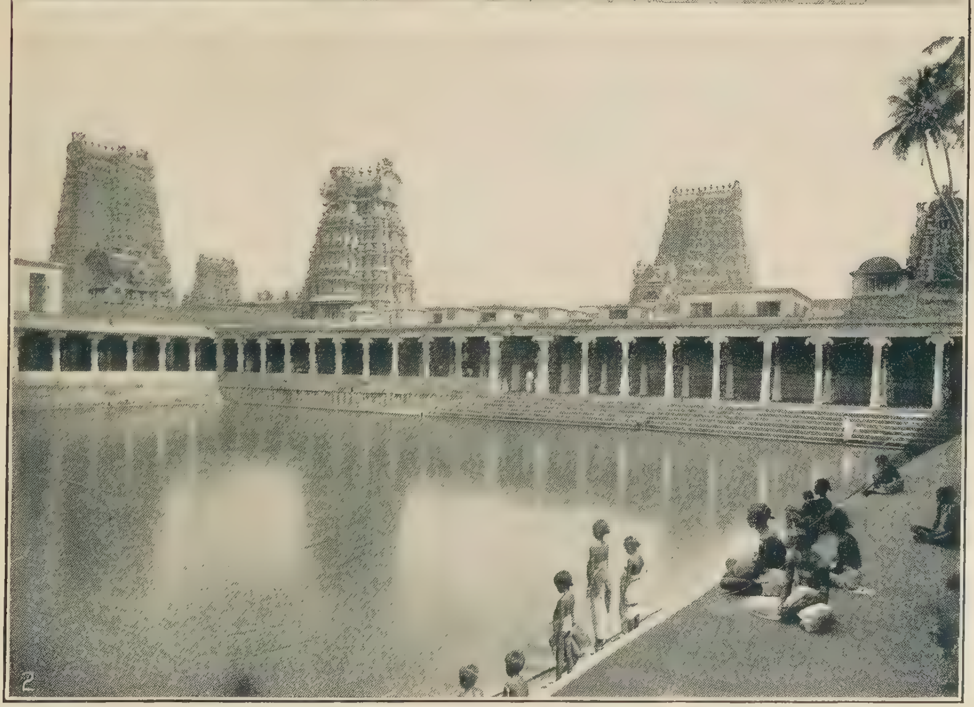
MOSQUITIA, mōs-kē-tē′ä. See Mosquito Coast.

MOSQUITO (diminutive of the Spanish *mosca,* a fly), a name applied to insects of the dipterous family *Culicidæ.* Mosquitoes are cosmopolitan, only a few oceanic islands, deserts and mountain tops being free from them. Frequently they occur in vast swarms, and they abound equally in arctic regions, as Alaska and Greenland, and in the tropical swamps of Africa and South America, while at many intermediate points they are intolerable pests. Vertically they range from the seashore to altitudes of at least 13,000 feet. While many species are local, others are very widely distributed. Typical mosquitoes have the following characteristics: The mouth is provided with a prolonged, suctorial, piercing proboscis; the greater part of the body and head and portions of the wings and legs are covered with scales which determine the color pattern; the complicated venation of the wings is also highly characteristic. These features distinguish mosquitoes from the related midges (*Chironomidæ* and *Cecidomyidæ*) and the black flies (*Simulidæ*); and from the crane-flies (*Tipulidæ*) which inspire most of the stories of gigantic mosquitoes. Not less than 22 genera and 350 species are now known. The species are based largely upon differences in the form and arrangement of the scales and the resulting coloration, the form of the foot-claws, etc.

Development.— The typical life-history of a mosquito is as follows: The eggs are deposited at night in or (rarely) near shallow water, usually fresh but in the case of a few species brackish or salt. After one or a few days they hatch into legless, aquatic larvæ, popularly known from their activity as «wigglers.» These have the mouth provided with small jaws for browsing at the bottom, and with brushes of hairs whose movements induce currents in the water and bring to the mouth floating particles or minute plants and animals which serve as food. The thorax is more or less swollen, and the abdomen slender and nine-jointed, with the last, or anal, segment bearing two pairs of leaf-like appendages and a more or less conspicuous fan of spreading hairs. On the dorsum of the eighth segment is a pair of spiracles, or breathing-pores, usually borne at the end of an elongated tube or siphon. By their active wiggling the larvæ come frequently to the surface and breathe, and then sink by gravity lazily to the bottom. After one or more weeks the larvæ molt finally and transform into pupæ, which have the head and thorax closely united, and the latter greatly enlarged, with the form of the future legs and wings apparent. At the tail end is a pair of fin-like expansions; while the respiratory organs, instead of being near the end of the abdomen, have the form of a pair of large mouthed tubes or funnels on the dorsum of the thorax. Like the larvæ the pupæ are active wigglers, but, unlike them, are buoyant and naturally float at the surface with the respiratory funnels uppermost and exposed. When alarmed they display much activity and wiggle violently toward the bottom. The imagoes escape from the pupal investments at the surface, and windrows of cast-off skins are thrown up at the water's edge. The males, which transform first, hover in little clouds and are sought by the females. In the males the antennæ are broad and feather-like, in the females slender and simply hairy. The duration of the period of aquatic life varies with the species and temperature; in our common *Culex pungens* it may be only 10 days, so that many generations may be produced during a favorable season. The winter may be passed in any stage from egg to adult, all of which are extremely resistant to cold, and the aquatic stages capable of withstanding repeated freezing and thawing. The hibernating imagoes, which are found in houses and other sheltered places, may become active on warm days and in the case of *Anopheles,* at least, are chiefly fertilized females. Mosquitoes have many natural enemies. The aquatic stages are preyed upon by carnivorous fishes, water-newts larvæ of dragon-flies and aquatic beetles and leeches. Vast numbers of the flying insects are destroyed by night-hawks and bats, and during

MOSQUES





1 Mosque at Delhi, India

2 Pool in Shaivite Temple, Madura, India

the day they are pounced upon by dragon-flies, hornets and other carnivorous insects, and snapped up by swallows and swifts as they skim the grassy meadows. Of their parasites the recently discovered worm, *Agammomermis culicis,* is considered to exert an important checking influence in some years.

Mosquitoes are weak fliers and usually seek shelter when the wind blows, so that railroad trains, ships and wagons are far more effective than their own wings in accomplishing their dissemination.

Notwithstanding that the chief human interest in mosquitoes arises from their blood-sucking habits, yet the taste for blood is certainly an acquired one and a relatively unimportant factor in the lives of the majority of mosquitoes. The normal food of both sexes of many species, and the only food of the males of nearly all, consists of the juices of flowers, fruits and other plant parts. In a few species a meal of blood by the female seems requisite to the maturation of the eggs, but this is decidedly exceptional. Most of the species are active chiefly at night, but a few, like *Stegomyia fasciata,* in which also both sexes bite, are most vicious during the early afternoon. The bites of all species are not equally irritating, probably the result of dissimilar qualities of the salivary secretion which is poured into the wound to facilitate the blood flow. Ammonia and glycerine allay the irritation. Besides the warm-blooded birds and mammals, mosquitoes attack fishes, frogs, turtles and even other insects.

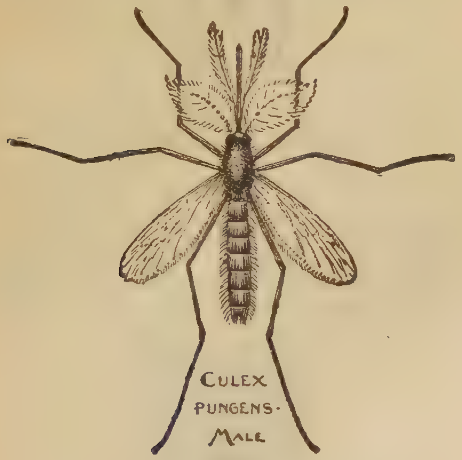


FIG. 1.

Until within a few years mosquitoes were regarded merely as intensely annoying pests, but since the definite discovery of their relation to disease-transmission their momentous importance has been recognized. Besides several diseases of the lower animals three serious human maladies — malaria, yellow fever and elephantiasis — have been definitely traced to their agency, and they are suspected of others.

Kinds and Characteristics.— Within the limits of North America nine genera and upward of 30 species are known to occur.

Illustrations are here given of the three varieties which assume importance through their relations to the human race: the *Culex,* or gutter mosquito, the *Anopheles,* or swamp mosquito, and the *Stegomyia,* or cistern mosquito.

Culex pungens prefers the gutter and may be likened to the sparrow among birds; it is noisy and numerous, and always hungry.

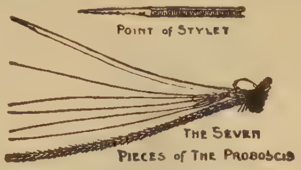


FIG. 2.

The male insect (Fig. 1) presents a rather bushy head-dress, by which it may be easily distinguished from the plainer but more dangerous female. Male mosquitoes are not blood-suckers, but vegetarians; for the reason that the male insect cannot pierce the skin and must, therefore, subsist on food more easily obtained.

The feeding organ of the mosquito, called the proboscis, is composed of seven parts (Fig. 2), which together form the organ by means of which the blood is reached and through which it is obtained.

In the male insect the stylet, or piercing instrument, is adherent to the neighboring parts and cannot move sufficiently to puncture the skin.

The female insect (Fig. 3) is plain as compared with the male. The palpi, those projections on either side of the central proboscis, are much shorter in the female; and the organs to the outer side, the antennæ, are not as beautifully plumed. The female of the *Culex* is very annoying, but is not known to transmit disease in this country, though it is suspected of conveying dengue fever. In eastern tropical countries a species of the *Culex* is connected with the disease known as elephantiasis.

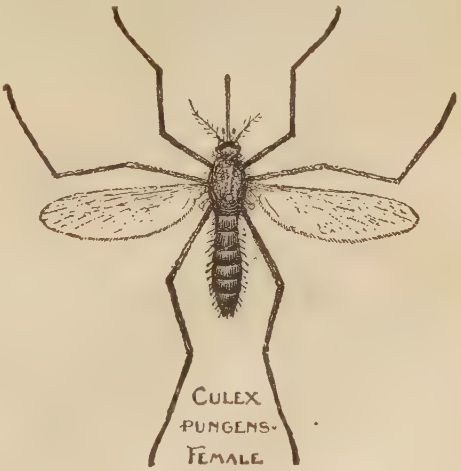


FIG. 3.

The *Anopheles* is the spotted-winged swamp mosquito, responsible for malaria in the human. A peculiarity of this mosquito is its long, thin legs, and the dark spots on the wings are characteristic. The same general difference in the head-dress of the sexes obtains, save that the palpi are about equally long in both, as may be seen by comparing the pictures (Figs. 4 and 5).

The *Stegomyia* is for the South by far the most important mosquito; not because it is most numerous, but because it is the natural conveyer of yellow fever. It has been called the tiger mosquito because of its striped appearance. It is a most beautifully marked mosquito and very dainty. It is essentially a domestic insect and is found only in inhabited localities. It is a day mosquito, and, resting on a dark background, such as a black coat or dress, presents a particularly striking appearance, the white bands on the legs and the peculiar marking of the back easily distinguishing it from any other (Figs. 6 and 6a).

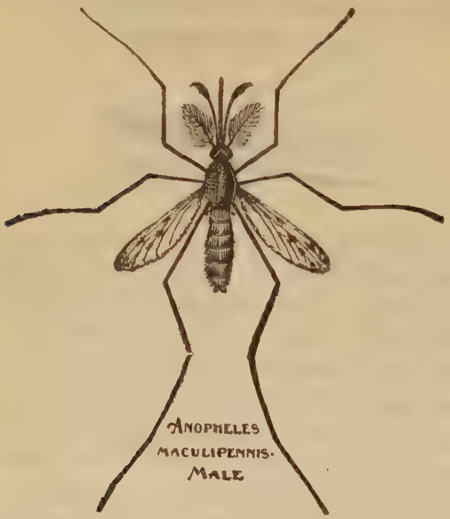


Fig. 4.

The antennæ of all male mosquitoes are more hairy than those of the female. Some of these hairs respond to sound by a vibratory motion; they are, therefore, auditory. These are the ears of the insect and it is believed that the male flies to the female guided by her song, adjusting the direction of his flight by turning his head until both antennæ are equally affected, when the object of his search is directly in front. The song of the insect is not produced solely by the buzzing of its wings, but also by the vibration of a peculiarly constructed chitinous process situated near the breathing apertures along the sides of the insect and set in motion by respiration. This is the famous yellow fever mosquito, which has been the greatest and most persistent enemy the South has ever had, costing many thousands of lives and many millions of dollars, but which is at last, happily, conquered, if we but use the weapons that have been put in our hands by the patient searchers for truth in the field of science.

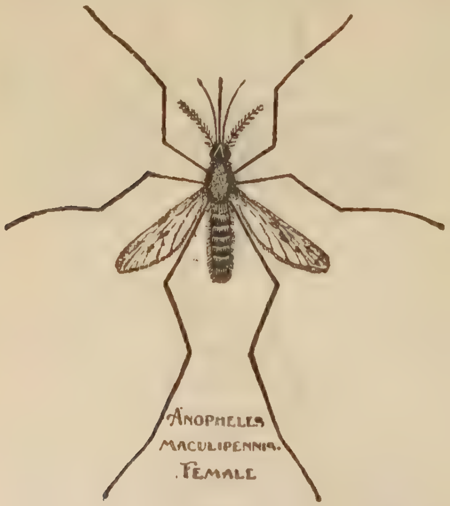


Fig. 5.

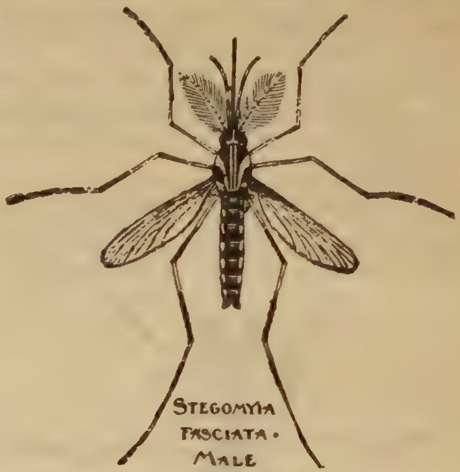


Fig. 6.

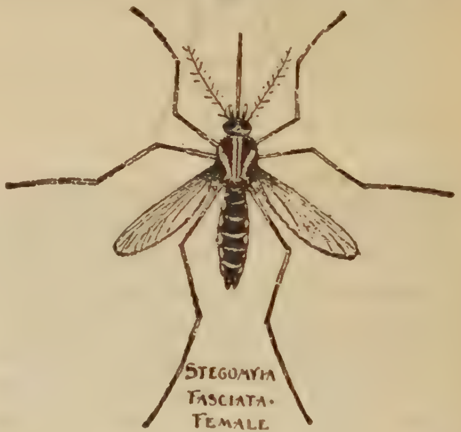


Fig. 6 a.

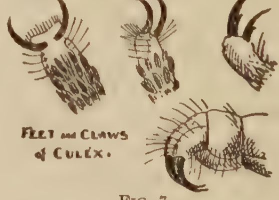


Fig. 7.

Mosquitoes cling to surfaces as a cat clings to the bark of a tree. A mosquito cannot rest on a perfectly smooth perpendicular surface; a fly can. A fly's foot is a sucker; a mosquito's foot is a claw (Fig. 7). Mosquitoes resting upon window panes would seem to deny this, but a window pane, very shortly after a thorough cleaning, may collect enough moisture and dust to form a film over the glass sufficient, though invisible, to afford a firm hold for the insect.

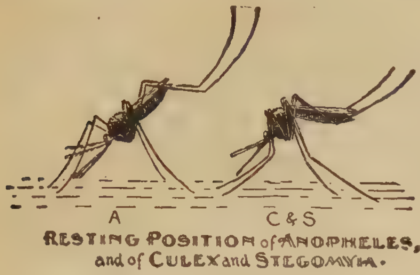

A
C & S
RESTING POSITION of ANOPHELES, and of CULEX and STEGOMYIA.

FIG. 8.

The resting position of *Anopheles* is peculiar in that the head, body and tail present a straight line, at an angle with the resting surface, while in the *Culex* and *Stegomyia* the body is bent as you observe in Fig. 8.

The eggs of *C. pungens* (Fig. 9), the gutter mosquito, are cone-shaped and float on end, being glued together in large masses to maintain this position in the water. The number deposited by a single mosquito varies from 50 to 400, and they hatch in from one to three days, varying according to temperature and environment. When a sufficient time has elapsed to complete the hatching process, the larva (Fig. 10) or wiggle tail issues from the shell and begins to feed on the vegetable and animal matter contained in the water.

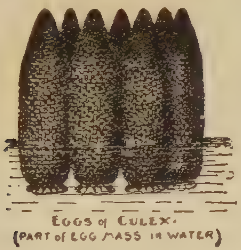

EGGS of CULEX.
(PART of EGG MASS in WATER)

FIG. 9.

In its growth the larva sheds its skin several times before the pupal stage is reached — in from 7 to 10 days. Mosquito wigglers get along apparently without air, when the surface of the water is covered with ice, and it is possible that they get air then, in the same way that fish do. This would account for their not being destroyed by surface freezing of the water. Entomologists must decide whether or not the larvæ have gills or some organ analogous to the gills of the fish. The wigglers of some mosquitoes may be frozen in ice and hibernate until liberated by warmer weather.

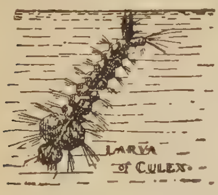

LARVA of CULEX.

FIG. 10.

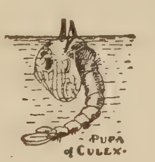

PUPA of CULEX.

FIG. 11.

The pupal stage in mosquito life corresponds to that of the chrysalis in the transition of a caterpillar into a butterfly (Fig. 11). The pupa does not feed. In about two days it becomes an imago, which is the technical name for the completed insect whose life begins with the ovum or egg.

The shell of the pupa breaks at its highest point and the completed mosquito issues, being supported by the floating shell until its wings spread for flight (Fig. 12).

The kind of mosquito that issues from the shell of the pupa depends of course on the kind of egg which has been deposited and hatched in the water.

The life cycle of *Culex*, the gutter mosquito, is from 10 to 15 days. Do not mistake the life cycle for the length of life; mosquitoes may live as adult insects for many months, and some females must hibernate through the winter to furnish eggs for the next summer's supply.

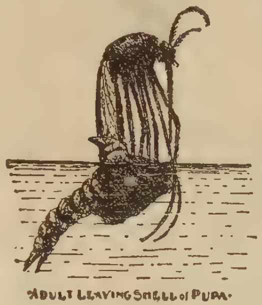

ADULT LEAVING SHELL of PUPA.

FIG. 12.

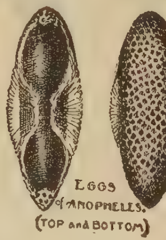


FIG. 13.

Eggs of *Anopheles* (Fig. 13), the swamp mosquito, are boat-shaped and float singly on the surface of stagnant pools. They are deposited in numbers between 40 and 100. The bottom of the floating egg is marked somewhat like mosquito netting, the pattern being raised. The top of the egg is smooth, black in color and partly covered by a transparent membrane which stands out from the surface of the top and sides, permitting intervening spaces of air, which float the egg like a lifeboat. The egg hatches in from three to four days.

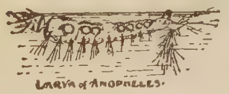

LARVA of ANOPHELES.

FIG. 14.

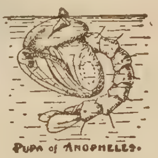

PUPA of ANOPHELES.

FIG. 15.

The larva of *Anopheles* (Fig. 14) may be readily distinguished by its position at the surface of the water, as well as by its general appearance, differing from that of either *Culex* or *Stegomyia*. You will observe that the neck of the *Anopheles* larva is very slender, and that the head is turned upon the body. This is because the *Anopheles* larva finds its food on the surface and gathers it by the constant motion of little broom-like processes projecting from the sides of the mouth, and furnished for this purpose.

The breathing tube, you will observe, projects from the back or upper surface of the larva, near the tail end. To get its mouth to the surface while maintaining its position for breathing, requires that the head should be turned half round on the body, an impossible position to any but the thin-necked *Anopheles* larva.

The larva becomes a pupa (Fig. 15) in about 12 days. In about five more days the pupa is a full-grown mosquito.

Eggs of *Stegomyia* (Fig. 16), the yellow fever mosquito, float singly upon the surface of the water and are deposited in numbers varying from 5 to 75. They hatch in from 10 hours to 3 days, according to climatic and other conditions. The shell is marked like mosquito netting, the white pattern being raised and somewhat similar to that of the *Anopheles* egg, and on the sides are air-chambers which float it.

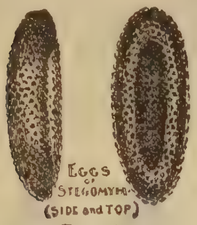

Eggs of Stegomyia (side and top)

Fig. 16.

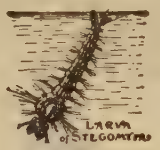


Fig. 17.

The larva (Fig. 17) is very similar in appearance to that of the *Culex,* and its position in the water is also similar to *Culex* and unlike *Anopheles.*

In about six days the pupa (Fig. 18) develops and in a day or two the mosquito begins its flight.

The larvæ of all mosquitoes have a breathing-tube near the end of the tail and the pupæ have a pair of breathing-tubes projecting from the body near the head.

The insect, both in the larval and the pupal stage, requires air, to obtain which the breathing-tubes at frequent intervals protrude from the water surface into the air above.

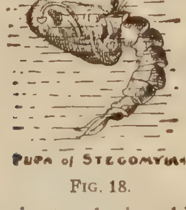


Fig. 18.

The life cycle of the different mosquitoes varies, as to duration of the formative periods, according to conditions favoring rapid development; and no hard and fast rules can be laid down as absolute in this regard. It may be said, however, that the cistern mosquito breeds, approximately, in one week, the gutter mosquito in two weeks and the swamp mosquito in three weeks.

Observe how both the larvæ and the pupæ rise to the surface to breathe. This necessity suggested that they could be destroyed by pouring oil on the water surfaces so as to cut off the air. It is estimated that about two tablespoonsful of ordinary kerosene will spread and film the water surface of an average cistern, and the oil will positively not affect the taste or healthfulness of drinking-water. The placing of oil upon drinking-water for the destruction of mosquitoes is not a new idea, for it was suggested as early as 1812 and has been practised for many years.

How Mosquitoes Transmit Disease.

Mosquitoes and Malaria.— Malaria is one of the greatest scourges to which man is subject. Its cause is fully established to be a minute unicellular animal parasite or hæmosporidium of the class *Sporozoa* (q.v.), living within the red blood-corpuscles and introduced by the bite of a mosquito. Each well-marked variety of malaria has its especial causal parasite, which passes through a complicated life-cycle. (See Malaria). The parasites enter the blood of the mosquito as minute slender sporozoites. When mature the sporozoites are freed into the body-cavity by the rupture of the wall of the sporocyst, when they migrate to the salivary glands, penetrate their walls and reach the proboscis through the salivary duct. When a mosquito harboring the parasites in this stage bites a susceptible human being, some of the spores pass into the blood with the saliva and induce an attack of malaria, mild or severe according to their number and other conditions. The malarial organism once introduced into the human system may continue to multiply indefinitely by the asexual method unless destroyed by drugs or some reaction of the organism, but that it can be transferred naturally to another person only through the intermediation of a mosquito and the intervention of the sexual generation. Properly speaking, man is the intermediate, the mosquito the final or definitive host, though the latter appears to suffer no ill consequences from the presence of the parasite. In pernicious tropical malaria, or æstivo-autumnal fever, the period for the complete development of the characteristic sporozoites (*Laverania malariæ*) in the mosquito is seven or eight days, but owing to the vast number of parasites of different broods present in the blood and their overlapping stages of development the exact time of schizogony is doubtful. Tertian and quartan fevers, the two best differentiated types of mild or benignant malarial fevers, are caused by related parasites known respectively as *Plasmodium vivax* and *P. malariæ*, which differ from *Laverania* chiefly in the replacement of the crescent stage by an immediately spherical gametocyte. Asexual sporulation recurs in the first form at intervals of 48 hours, and in the latter of 72 hours, corresponding with rhythm of the fever's paroxysms. Daily or other intermediate recurrences are due to double or triple infections, in which the different broods sporulate on alternate days or in other combinations.

It was not until 1880 that Laveran, a surgeon in the French army, discovered the amœbulæ in the blood of malarial patients in Algiers; the development of the sexual generation in the mosquito and its relation to Laveran's parasite were traced by Ross in 1897–98, while to the Italian zoologist Grassi is due the first clear demonstration of the effectiveness of preventive measures directed at the mosquito.

Our scientific knowledge of the subject was almost entirely created within the five years subsequent to 1898, and workers in many countries are constantly adding details. That several species of *Anopheles,* and especially *A. maculipennis,* are the chief, and so far as known the sole disseminators of all types of malarial fever, is absolutely and thoroughly demonstrated from every standpoint.

Mosquitoes and Yellow Fever.— In the case of yellow fever our knowledge is in a very different and less satisfactory state. The relation of mosquitoes to this disease was suspected by Dr. Finley as early as 1881, but his theory excited little interest until, upon the occupation of Cuba by the American navy, a Yellow Fever Commission of inquiry, headed by Major Reed, was appointed. By a series of very careful experiments it has been established that mosquitoes are agents in the dispersal of this disease, and at the same time the old view of infection by contact and the old practice of isolation and fumigation for prevention have been nearly repudiated. The particular species of mosquito which transmits yellow fever is *Stegomyia fasciata,* an especially fierce biter in the early afternoon, which is found in the tropical parts of both hemispheres, and in America as far north as Virginia.

The germs of the disease may be taken by the mosquito only during the first three or four days of the fever; after that time the blood of the patient cannot infect the mosquito. The germs require about 12 days to migrate from the stomach of the insect to the salivary glands, from which they may be injected through the mosquito's biting organ into the human blood stream. Mosquitos, after becoming infectious, are capable of inoculating the disease into the human at intervals of three days (period of feeding) for practically an indefinite time.

The adaptation of protective measures to this important discovery renders the prevention or suppression of an epidemic very simple, theoretically. Screening the patient from mosquitoes during the first four days of fever (before the diagnosis), or killing all mosquitoes in the room before the 12th day after their possible infection, will certainly prevent a second case.

Agency in Other Diseases.— Elephantiasis or filariasis, like malaria, results from the presence in the blood of an animal parasite, but one of a very different nature. The adult males and females of the *Filaria,* which is a slender nematode worm, live together in the subcutaneous lymph vessels and produce enormous numbers of living, minute embryos which swarm in the blood, usually passing into the superficial capillaries at night and retreating to the deeper vessels by day. This peculiarity first led Manson to suspect the mosquito as a means of distribution and as a result of his studies and those of Bancroft and others on the *Filariæ* of man and the dog, it is now known that when infected blood is swallowed by *Culex fatigans* and other mosquitoes the embryos pass through certain stages of development within the intestine and malpighian tubules and then migrate through the body-cavity and tissues to the proboscis, from which human infection occurs. About three weeks are required to complete the development within the mosquito, and a year before the worms become sexually mature in the final host. Elephantiasis is a dreadful and prevalent disease in tropical countries, and is frequent in the Southern States, but rare in temperate climates.

The mosquito is suspected of being instrumental in the spread of leprosy and other diseases, and undoubtedly many important discoveries await the investigator in this field.

Restraining Local Pests of Mosquitoes.— The possibility of the control or complete extermination of mosquitoes has received serious attention from zoologists, physicians and sanitary engineers, and is encouraged by local and national governmental grants. Wherever the problems have been carefully considered, as in New Jersey, Long Island, the Connecticut coast and Winchester, Va., in this country, much has been already accomplished toward the mitigation of the pest. As to measures, the complete destruction of all breeding-places by the draining of swamps, pools and ditches is the most effective and permanent. This must be supplemented by emptying or suitably protecting by screening against the access of gravid mosquitoes all artificial vessels, such as pails, rain barrels, cisterns, privies and drains, which contain standing water in which mosquitoes may breed. A most effective and simple measure for local application is to pour a small quantity of kerosene upon the surface of the water of possible breeding-places. This spreads as a delicate film which deters the larvæ and pupæ from coming to the surface to breathe, so that they quickly suffocate, and at the same time kills or drives off females which come to lay their eggs. The application should be repeated at intervals of two or three weeks. Small fishes and the other natural enemies named above may be introduced into breeding-places to good purpose. The usual methods of ridding houses of mosquitoes by fumigation with sulphur dioxide gas; of preventing their entrance by thorough screening; and of protecting the person by the application to the skin of oil of citronella and other substances have a certain protective value. The most approved application is a mixture of one ounce each of oil of citronella and spirits of camphor with half an ounce of oil of cedar. The effect will last longer if incorporated with vaseline. It has been shown by the experiments of Grassi and others that this method alone is sufficient to grant immunity from malaria to inhabitants even of such fever-scourged districts as the Campagna of Rome. For the medical treatment of malaria we have a powerful specific in quinine, which is most effective at the time of the paroxysms, when the sporulæ are free in the blood-plasma and most susceptible to the action of the drug. See MALARIA.

Bibliography.—Doty, A. H., 'The Mosquito: Its Relation to Disease, and Its Extermination' (New York 1912); Herms, W. B., 'Malaria: Cause and Control' (New York 1913); Howard, L. O. (et al.), 'The Mosquitoes of North and Central America, and the West Indies' (4 vols., Washington, D. C., 1914–17); Smith, J. B., 'The Mosquito Investigation in New Jersey' (New York 1905); American Mosquito Extermination Society 'Year Books' (New York 1904 onward); Mosquito Extermination Commission of Hudson County, N. J., 'Annual Reports'; United States Agricultural Department 'Farmers' Bulletin 444 (Washington 1911);

California Agricultural Experiment Station 'Bulletin 178' (Sacramento 1906); Connecticut Agricultural Experiment Station 'Bulletin 173' (New Haven 1912); New Jersey Agricultural Experiment Station 'Bulletin 276' (New Brunswick, N. J., 1915).

MOSQUITO BEE, one of the small, gregarious, stingless honey-bees of the genera *Trigona* and *Melipona,* which make very large combs of bitterish honey in the tropical forests. Their stings are blunted and are never used as a weapon. Ordinarily they place these deposits in hollow trees, but sometimes suspend them from branches, protected from enemies in various ways.

MOSQUITO BLIGHT, a disease of Oriental tea-plants resulting from the attacks of great numbers of plant-bugs of the family *Capsidæ.* They breed upon the plant and young and old suck its juices.

MOSQUITO COAST, or **MOSQUITIA,** Central America, an extensive region on the Caribbean Sea, still unexplored, forming the eastern seaboard of Nicaragua; area, 26,000 square miles. It is inhabited by Mosquito Indians. For a considerable period it was governed, under British protection, by a native chief, but in 1860 it was made over to Nicaragua. (See CLAYTON-BULWER TREATY). In 1894 it was incorporated with Nicaragua and is now known as the department of Zelaya. Capital, Bluefields.

MOSQUITO FLEET, in the navy, a term given to what is known as «the second line of defense,» which is used in protecting the fortifications and harbors along the coast line, and, like the insect for which it is named, annoys the enemy in every way, at the same time preventing the possibility of a blockade. A fleet of this kind was organized during the Spanish-American War in 1898, and was composed of all sorts and kinds of ships to the number of about 130.

MOSQUITO LAGOON, Fla., a salt water lagoon on the east coast 30 miles long by one mile wide, separated by a sandy strip of land, half a mile to five miles wide, from the ocean, and connecting with the latter by Mosquito Inlet and Haulover Canal, navigable for boats of very shallow draught. It connects also on the north with Halifax River and on the south with Indian River. Fish and oysters are plentiful in its shallow waters, but mangrove swamps, sand and coral banks obstruct navigation even by the smallest boats.

MOSS, Frank, American lawyer: b. Cold Spring, N. Y., 16 March 1860; d. 5 June 1920. He was educated in the College of the City of New York. In 1897 he was president of the board of police in New York and was counsel to the «Lexow Investigating Committee.» In 1899 he was leading council for the «Mazet Investigating Committee,» thereafter was connected with the Society for the Prevention of Crime and was professor of medical jurisprudence in the New York College and Hospital for Women. As assistant district attorney of New York he was associated with the prosecution of Lieut. Charles Becker for the murder of Herman Rosenthal. He is the author of 'The American Metropolis' (3 vols., 1897).

MOSS, Lemuel, American Baptist clergyman: b. Owen County, Ky., 27 Dec. 1829; d. New York, 12 July 1904. He was graduated from the University of Rochester in 1858 and became pastor of the First Baptist Church of Worcester, Mass., in 1860, and thereafter held professional and editorial posts. He was president of the University of Chicago in 1874–75 and of the University of Indiana in 1875–84. He was president of the American Baptist Historical Society in 1895–1900. He published 'Annals of United States Christian Commission' (1866); 'A Day with Paul,' etc.

MOSS-ANIMALS, or **BRYOZOA.** See POLYZOA.

MOSS-BUNKER, a common name about New York for the menhaden (q.v.). It is one of many forms of the Dutch name «marsbanker» for the scad, ignorantly applied by the early Hollanders, and has been misspelled and mispronounced in a great variety of ways. A detailed account of this matter will be found in Goode's 'Fishery Industries of the United States' (Sec. I, 1884) as a part of the history of the menhaden.

MOSS-PINK. See PINKS.

MOSS SIDE, England, town in Lancashire, near Manchester, of which it really forms a part. It has a great cotton-goods industry. Among its public works are the Saint Edmund's Gothic Church (1882), a free library, slaughter-houses, etc., and the tramways are owned by the city, while gas, electric light and waterworks are the property of a Manchester corporation. In 1911 there was a population of 33,100.

MOSS TROOPERS, in English history, bands of marauders infesting the districts which divided the English and Scottish territories before the union in 1707. They were rarely heard of after that year. The name was derived from the character of the country over which they conducted their nefarious operations.

MOSSAMEDES, mŏs-sä'mạ-dĕz, Africa, capital of the most southerly district of Portuguese West Africa, situated on a small bay, in a rainless, sandy, desolate neighborhood, but with healthy climate and palm-lined streets. It has a government building and does an increasing trade with Portugal, having connection by a steamship line with Oporto. It has a population of less than 5,000, nearly half white men.

MOSSES (*Musci*), a class of cryptogamous plants, forming with the liverworts (*Hepaticæ*) the group *Muscineæ* or *Bryophyta.* The only plants likely to be wrongly called mosses are the foliose liverworts, and these are readily distinguished by their two-ranked nerveless leaves, their four-valved capsule and certain other characters. A germinating moss spore gives rise to a filamentous body called a *protonema,* from which buds arise and develop into the leafy shoots which constitute the true moss-plants. After a time the reproductive bodies are formed at the tips of certain shoots. The *antheridia,* or male reproductive organs, are club-shaped and contain cells which afterward develop into the *antherozoids.* These antherozoids, when liberated from the antheridium, move about until they come in contact with an *archegonium,* or female reproductive body. The fertilized archegonium is then carried upward on a slender filament or *seta,* and now forms the fruit or *capsule,* usually closed by a lid or *operculum,* and often covered by a sort of hood called a *calyptra.* When ripe the capsule opens and liberates the spores, which by germination begin the life-history again. Mosses may also reproduce themselves asexually by the formation of buds or *gemmæ.* There are no true roots in mosses and the leaves are of very simple structure. New ones are continually springing from old shoots, so that in bogs the top remains growing while the underlayers die and the deeper ones slowly change into peat. Some 5,000 species of mosses are known, of which about nine-tenths belong to the order *Bryaceæ.* This order comprises the two suborders, *Cleistocarpæ,* with an indehiscent capsule, including the genera *Phascum, Ephemerum,* etc., and *Stegocarpæ,* in which the capsule opens by a lid. The stegocarpous mosses, again, may have the capsule either terminal (*Acrocarpæ*) or lateral (*Pleurocarpæ*), the former group including, among others, the genera *Grimmia, Fissidens, Polytrichum, Orthotrichum, Dicranum, Mnium, Bryum* and *Funaria,* and the latter, *Hypnum, Leskea* and *Climacium.* There are three other orders of mosses, namely, *Sphagnaceæ,* or Bog-mosses, with only one genus, *Sphagnum; Andreæaceæ,* with the single genus *Andreæca,* and *Archidiaceæ,* with the genus *Archidium.* Mosses are of little or no economic value, but they form an important part of the natural covering of rocks and serve to prepare the way for higher forms of plants. Consult Campbell, ‹Mosses and Ferns› (New York 1895); Grout, A. J., ‹Mosses with a Hand-Lens› (2d ed., New York 1905); Hale, E. H., ‹Flowerless Plants› (New York 1909); Strasburger, ‹Textbook of Botany› (1903).

MOSSES FROM AN OLD MANSE, title of Nathaniel Hawthorne's second collection of tales and sketches (1846). The Old Manse, Hawthorne's Concord home, is described in the opening chapter of the book. The remaining contents include many of Hawthorne's most famous short sketches, such as ‹The Birth-Mark,› ‹Roger Malvin's Burial› and ‹The Artist of the Beautiful.› These bear witness to his love of the mysterious and the unusual; and their action passes in a world of unreality, which the genius of the author makes more visible than the world of sense.

MOSSLEY, England, town in Lancashire, located on the Tame and the Huddersfield Canal. It contains great woolen factories and foundries and has among its public buildings a modern Gothic church, handsome town-hall in a park, besides markets, gasworks, etc. Its population in 1911 was 13,205.

MOST, mōst, **Johann Joseph,** German-American anarchist: b. Augsburg, Bavaria, 5 Feb. 1846; d. Cincinnati, Ohio, 17 March 1906. He learned bookbinding and traveled on the Continent in the pursuit of his trade. Later he was editor of the *Freie Presse* at Berlin and in 1874–78 member for Chemnitz in the Reichstag. Expelled from the Socialist ranks in Germany, he went to London, where he founded *Die Freiheit,* an anarchistic sheet, in 1879. In 1881 he was arrested and sentenced to 18 months' imprisonment for printing an article approving of the assassination of the Emperor Alexander II, and upon his release came to the United States. He continued *Die Freiheit* in New York. In 1901 he was arrested for a seditious editorial in his journal after the assassination of President McKinley and sentenced to a year's imprisonment, commencing June 1902. He published several anarchistical writings, such as ‹Why I Am a Communist› (1890) and ‹Down With the Anarchists› (1901).

MOSTAGANEM, mŏs'tạ-gạ-nĕm', Algeria, capital of the arrondissement in the province of Oran, located on the Bay of Arzeu. It has a branch of the Oran-Algiers Railway and is connected also with the military station Tiaret. It is situated on a steep cliff 280 feet above the Mediterranean Sea and has a deep-water harbor into which steamers enter. The Ain Safra River feeds water power here to flour mills, and it does considerable export to Europe in wine, wool, cattle, grain, figs, etc. It is situated on the ruins of an important city of the old Roman period and was flourishing in the 16th century under the Berbers, but lost its prestige till the French in 1833 captured the site and built up its industries. In 1911 it had 21,087 inhabitants in the commune.

MOSTAR, mōs'tär, Bosnia, former capital of Herzegovina, now belonging to the circuit of Mostar. It is a station on the Bosnian Sarajevo-Mostar-Metković State Railway and is picturesquely situated along the cliffs from Podvelez and Ham in the narrow valley of the Narenta. The latter is spanned by an imposing, single-arched, stone bridge. The town is built of stone and was formerly strongly fortified with its star-batteries and walls. It has 25 mosques, two Oriental-Greek and one Roman Catholic church, besides a convent of the Sisters of Mercy. Its industries consist of arms, leather and tobacco factories and wine culture. There are several Catholic and orthodox schools, a trade school, high gymnasium, fruit and wine-culture schools, etc. It is the seat of a Catholic and a Greek bishop. Its population in 1910 was 16,369.

MOSUL, mō'sool, Mesopotamia, capital of a vilayet and sanjak of the same name, on the right bank of the Tigris, 220 miles northwest of Bagdad. A stone bridge continued by a bridge of boats crosses the river to the site of ancient Nineveh. The town is surrounded by decayed walls, and has houses of stone and brick, mosques, shrines, Christian churches, convents, etc. Formerly a place of much commercial importance, it has greatly declined, mainly owing to diversion of traffic due to the opening of the Suez Canal, but it still carries on some trade, especially in gall-nuts. Muslin is named from this town. Population about 80,000, mostly Mohammedans, but including about 7,000 Christians and 1,500 Jews. The vilayet has a population of 351,200.

MOSZKOWSKI, mŏsh-kōf'skē, **Moritz,** Polish composer and pianist: b. Breslau, 23 Aug. 1854. At 19 he began to appear in public after studying at Dresden and Berlin. His success was immediate and striking and he made frequent concert tours. He has resided chiefly in Berlin and Paris. He is a talented composer; his opera ‹Boabdil› was presented at Berlin in

1892; his other works include a ballet, ‘Laurin’; a symphonic poem, ‘Jeanne d'Arc’; some ‘Danses espagnoles’ for the piano or violin; and the two orchestral series called ‘Les Nations.’

MOTA-PADILLA, mō'tä pä-dēl'yä, **Matias de la**, Mexican historian: b. Guadalajara, Mexico, 1688; d. 1766. He was a lawyer, and during the latter part of his life a priest. He wrote, among other works, ‘History of the Conquest of New Galicia’ (1870–71).

MOTET, or **MOTETT**, a vocal composition in harmony, set to words generally selected from sacred writings. Like the madrigal, the motet was at first set to words of a profane character, and there are ecclesiastical decrees extant forbidding its use in church.

MOTH, any insect of the order *Lepidoptera* not included among the butterflies (q.v.). Moths have antennæ of many forms, and on account of this variability are often grouped in a section *Heterocera*, but their antennæ are rarely swollen at the end, or «clubbed,» and never in the North American forms. They are farther distinguished from butterflies by their wings being horizontal when at rest, and by their being seldom seen on the wing except in the evening or at night, although certain species of moth fly in the brightest sunshine, and some butterflies appear at twilight. In most cases there is a peculiar arrangement of interlocking spines (frenulum and retinaculum) by which the hind wings are kept in contact with the front wings during flight. The pupæ are never angular; are mostly smooth and dark-colored; and are often enclosed in a cocoon, which the larva spins before it passes into the pupal stage. Moths are in general larger than butterflies and more hairy or downy in character. A Brazilian giant measures nearly a foot from tip to tip, and there is a gilded species smaller than a pin's head. Similarly they present as great a variety of outlines and as much beauty (with less gaudiness) as do the butterflies; and they interest the philosophical naturalist by the extraordinary adaptations to conditions which many of them present, and which have come about in the development of the race. Some of the most extraordinary examples of sexual of protective coloration (q.v.) and resemblance, of mimicry (q.v.) and of curious armaments, are to be found among these creatures, whose small size, weakness and edibility, especially when in the larval condition, render essential means of concealment and of passive defense. Nevertheless caterpillars of moths, as well as of butterflies, furnish a large part of the food of birds and of various other insect-eating animals; and in the adult state they are seized by night-flying birds, by lizards, monkeys, turtles, and by some predatory insects and spiders. The eggs of moths are laid upon the proper food-plant of the species, and are various in form, ranging from that of a sphere or a cylinder to that of a disc, often with the surface beautifully sculptured or ornamented. Each has a micropyle or lidded opening from which the larva escapes. They are laid by most species of temperate regions in the early summer, and the life-cycle of the insect is completed before the end of the season; but some moths oviposit in the autumn, when their eggs remain quiescent through the winter, or, in some cases, hatch in time for the larva to partly grow, then hibernate and complete their development the following spring.

The larvæ or caterpillars of moths, like those of butterflies, hatch as very minute objects, but rapidly grow, shedding their skins (see Molting) at intervals to permit of enlargement, until some attain a length of six or seven inches. Most moth-larvæ molt five times, but some oftener and a few less times.

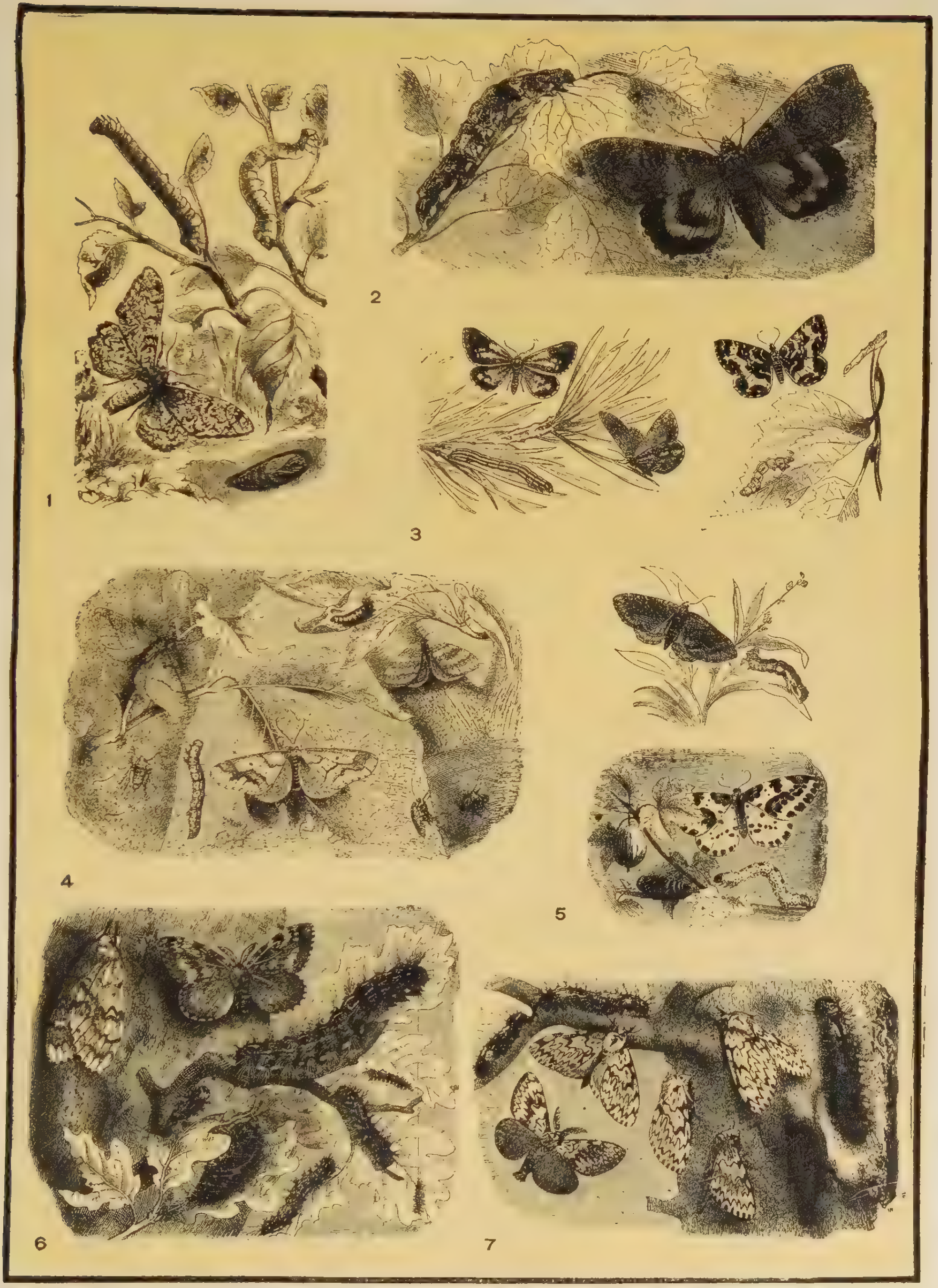
The larval condition is the insect's period of feeding and growth, some species taking no food whatever in adult life. The vast majority feed upon green vegetable food, leaves most of all; and are among the worst foes of our parks, orchards and gardens, attacking cultivated plants in a great variety of ways. «A few larvæ,» remarks Holland, «feed upon woody tissues, and bore long galleries under the bark or in the wood of trees.» (See Moth, Leopard; Moth, Brown-tail; Moth, Gypsy). Others feed upon the pith of herbaceous plants. A number of species feed upon the inside of growing furits. Only a very few species are known to be carnivorous. The household moths (*Tineæ*) are well known on account of the injury they work among clothes, carpets, furs, etc. Other species attack grain, meal, flour, hay, tobacco, dried herbs, drugs and a variety of stored products; other bore into timber, or damage human property in some other way. Some recompense is obtained, however, from the silkworms (q.v.), the moths whose cocoons furnish silk.

There is considerable variety in the form of the caterpillars of moths, but most are worm-like, and the structure and appendages resemble those of butterfly caterpillars (q.v.). The great majority possess besides the six minute thoracic legs the usual four pairs of «prolegs,» or false feet, in the middle of the body, and a fifth pair on the hindermost (13th) segment (somite) of the body, which in reality are clasping organs needed for clinging to twigs in the process of molting. In some (numerous geometrids, noctuids and psychids) these prolegs are reduced in number, and in the geometrids they are placed in only two pairs on the 9th and 13th segments, and these larvæ can progress only by looping the body upward (see Measuring-Worms). Other variations of this feature exist, as the sucker-like pads of the *Megalopygidæ* and *Cochlidiidæ*.

«The bodies of the larvæ of moths,» to quote Holland, «are covered with tubercles, the location and arrangement of which have in recent years received considerable attention from students, and are thought to furnish a clue to the lines of descent of certain families. These tubercles sometimes carry only a single hair, in other cases they carry large tufts of hairs; they may be small and inconspicuous, or they may be developed until they assume the form of great spines, horns, or bulbous projections.»

Some moth caterpillars exhibit bright and beautiful colors, and move about fearlessly, protected by thorny projections, or nauseous exudations, or by hairs which possess severe stinging properties. Others present striking examples of protective resemblance and mimicry, in color or form or attitudes, or all three respects. While many are solitary in their habits

FOLIAGE-EATING MOTHS



1 Pepper Moth, with larva and pupa
2 Red Underwing, with caterpillar
3 Pine Moths, with caterpillar
4 Group of Geometrid Moths
5 Currant-worm Moth (Abraxas)
6 Gipsy-moth, illustrating development
7 Black Arches Moth, in various stages

others are gregarious, forming «armies» and «processions» during their feeding life which disperse when the time for pupation arrives.

Many moth-larvæ enter the ground and surround themselves with an earthen cell in which to transform into and pass the pupal stage. Others spin cocoons in great variety, usually formed more or less of silk, and well protected against both the weather and enemies. Some are hidden away under leaves, beneath loose bark, in the crevices of rocks or old stumps or fastened to the branches of trees. As a rule the cocoons are whitish or brown in color, never ornamented with the bright silvery or golden spots characteristic of the chrysalids of many butterflies. Escape from the tough silken kind of cocoons is aided by a copious saliva which dissolves or cuts the silk, so that the newly-born insect may wriggle out.

The anatomy of the moths is substantially the same as that of butterflies, but in these heterocerous families the head is not so prominent. The eyes, however, are often larger and better, as would be expected of insects mainly crepuscular in their habits; and some have the suctorial apparatus in high perfection, so that many of the hawk-moths and noctids can poise upon whirring wings, and inserting the long proboscis suck nectar from flowers without alighting; and these take a considerable part in the cross-fertilization of plants. On the other hand, in the bombycine moths and their allies, the proboscis is small and some of them have no mouth-parts or ability to feed at all. «They are simply animate winged reservoirs of reproductive energy, and, when the sexual functions have been completed, they die.»

The antennæ of moths assume a great variety of forms. They may be simple or branched, thread-like, furiform, spatulate or like broad feathers; and those of the males frequently differ from those of the females. In an attempt at classification various subdivisions have been proposed, but lepidopterists no longer make artificial groupings of the families, whose inter-relationships seem very uncertain. Most of the families, of which about 50 are recognized by modern systematists, are represented in America, but several families are confined to the Oriental regions, and a few are exclusively African. The criteria principally used in separating families are found in the character and arrangement of tubercles, and in the structure of the wings. The lowest are the very small moths called *Micropterygidæ*, with bronzy golden wings, whose larvæ show striking affinities with the caddis flies, and feed in damp moss. The large yellowish-brown «swift» moths (*Hepialidæ*) come next, whose larvæ and incomplete pupæ live underground and feed on roots; followed by the *Zygænidæ* or burnet moths, which are small day-flying insects adorned with bright metallic colors. Their larvæ feed openly on various plants, and spin elongated cocoons. The tropical *Chalcosiidæ* and *Limacodiidæ* are allied to them; also the large, day-flying, brilliant tropical castniids, which have clubbed antennæ like butterflies. The small family *Megalopygidæ*, of hairy American moths, are singular in having seven pairs of prolegs. The *Psychidæ* are a small but universally distributed family characterized by the extreme degradation of the wingless females; the caterpillars live in portable cases made of sticks, grass, etc., and are called «basket worms» (q.v.). The *Cossidæ* are large moths, unable to feed, most numerous in the tropics and exemplified in Europe by the well-known gnat and leopard moths (qq.v.); only two species are North American; and the *Sesiidæ* are the clearwings (q.v.), resembling wasps. In the *Tortricidæ* is found a very large assemblage of small species known as leaf-rollers (q.v.), plentiful in the United States and embracing many pests, as the codling moth, etc. Another immense family of evil repute is the *Tineidæ*, represented by the clothes-moth, flour-moths (qq.v.) and the like, which damage woolen goods, furs and stored products of every kind, as well as feed upon plants, some of them performing an essential work in cross-fertilization, conspicuously the yucca-moths (q.v.); there are thousands of species. The plume-moths (q.v.) come next, followed by a series of families having obtect pupæ, which never emerge from the cocoon until the final molt. Among these are the *Pyralidæ*, a huge and varied family, having nearly 800 beautifully marked species in the United States alone, and largely destructive to cultivated plants. Representatives are the grape-leaf-folder, print-moth, sugar-beet moth, clover-hay worm, snout-moths, grass-moths, corn-stalk borer, bee-moth, leaf-crumplers, dried-currant moth and others, many of which are elsewhere described in this work. The egger-moths, tussock-moths (qq.v.) and some minor families are nearly related to the pyralids. The gayly colored tiger-moths (q.v.) carry the list to the owlet-moths (q.v.), which belong to the cosmopolitan nocturnal group *Noctuidæ*, and these are followed by several families, chiefly belonging to the Old World. Then come the *Sphingidæ* (see DEATH'S-HEAD and HAWK-MOTH), familiar all over the world; and the great assemblage of small, plainly but exquisitely colored geometrids (see MEASURING-WORM). Closely related are the tropical *Uraniidæ*, which contain large and magnificent green and gold tropical species — the glory of the forests of Brazil and the East Indies. Many of these, as of the Oriental family *Epicopiidæ*, are «tailed» and simulate the papilionid butterflies in many ways. Next to these are placed the silk-worm moths (*Bombycidæ*), and several families of large tropical moths, leading up to the great Saturnians (*Saturniidæ*), scattered over most of the warmer parts of the world; among them is the great *Attacus atlas* of India, the largest of all *Lepidoptera*, and many of the largest and most notable of American cocoon-making species, such as the Ailanthus silk-moth, the Cecropia, Polyphemus, Luna and several others well known and elsewhere described.

Bibliography.— The literature relating to moths is very extensive. The most complete and scientific account of the families, technically considered, is found in Hamson's ‹Catalogue› of the moths of the world, published since 1898 by the British Museum. The Smithsonian Institution published simultaneously a ‹List› of North American species by H. G. Dyar. The textbooks of Packard and Comstock give sufficiently full accounts of structure; and Carpenter's ‹Insects and their Structure› (1899), and Sharp's ‹Insects› (Vols. I and II, of Cambridge Natural History) (1895–99), contains a résumé of general information and of modern views as to relationships, phylogeny, etc. A good reference book for the British species is Newman, L. W., and Leeds, H. F., ‘Text-Book of British Butterflies and Moths’ (Saint Albans 1913). The best general illustrated descriptive work on North American species is W. J. Holland's ‘The Moth Book’ (New York 1903), which contains an extensive classified list of books relating to the whole subject, including the splendid monographs of American families by Packard, Grote, Smith, Beutenmüller, Hulst, Dyar and others. Among the more or less popular works treating of the moths are Dickerson, Mary C., ‘Moths and Butterflies’ (Boston 1901); Robertson-Miller, Edith, ‘Butterfly and Moth Book’ (New York 1912); Stratton-Porter, G., ‘Moths of the Limberlost’ (New York 1912).

MOTH, Brown-tailed, a moth (*Euproctis chrysorrhoa*) of the family *Liparidæ*, accidentally imported from Europe in 1890 or 1891, and nearly related to the gypsy and tussock moths. Its color is white, with the hinder end of the abdomen brown. The caterpillars defoliate trees and have done much damage throughout the greater part of New England, as well as become an annoyance by their flying hairs which irritate the skin; but the insect is not so much feared as is the gypsy moth. This moth lays in midsummer about 250 eggs underneath the tip of a leaf, and covers them with its hairs. The larvæ appear in early autumn and begin to eat the green substance of leaves, skeletonizing them; they also feed on apples and pears. In mid-autumn they form cases of bits of leaves, attach them to twigs by silken strands, pass the winter in them, complete their growth the following spring, feeding on foliage, flowers and fruit, and then pupate in June and emerge in midsummer. The larvæ may be killed by arsenical sprays. Another mode of control is the destruction of their cocoons in the winter. They are easily transported with twigs or Christmas trees or nursery stock and these should always be inspected. See GYPSY MOTH. Consult any work on agricultural entomology.

MOTH, Gypsy, or Gipsy. See GIPSY-MOTH.

MOTH, Leopard. See LEOPARD MOTH.

MOTHER ANN. See LEE, ANN; SHAKERS.

MOTHER CAREY'S CHICKEN, any of several small oceanic petrels (q.v.); specifically, in the Mediterranean and Atlantic, the storm-petrel (*Procellaria pelagica*) often seen about ships, especially in wild weather, and looked upon with superstitious dread by sailors. Its manner of paddling along the surface of the waves suggested the name petrel, namely, little Peter (the Apostle), afterward transferred to the whole group; and the «Mother Carey» is supposed to be a queer Anglicization of the Latin *Mater Cara* («Dear Mother,» an appellation of the Virgin). These little petrels are about six inches long, sooty black, with white rumps and a little white on the wings. They breed numerously on all northern coasts, as about Newfoundland, Labrador, North Greenland and the British Isles, wherever suitable places can be found, occupying holes in the face of earth banks, like bank-swallows, and rarely approaching or leaving their nests, each with a single white egg, except at night.

MOTHER OF CITIES, the euphemistic local title for Balkh (q.v.), central Asia.

MOTHER GOOSE'S MELODIES, the well-known collection of nursery rhymes. In 1860 a story was started to the effect that «Mother Goose» was a Boston woman; and she was identified as Elizabeth Goose, widow of Isaac Vergoose, or Goose, and mother-in-law of Thomas Fleet, a Boston printer, who issued a collection of the ‘Melodies’ in 1719. It is now conceded that «Mother Goose» belongs to French folklore and not to English tradition. Charles Perrault (q.v.), b. Paris, 1628, was the first person to collect, reduce to writing and publish the ‘Cortes de Ma Mère l'Oye,’ or ‘Tales of Mother Goose,’ though he did not originate the name; and there is no reason to think that «Mother Goose» was a term ever used in English literature until it was translated from the French equivalent, «Mère l'Oye.»

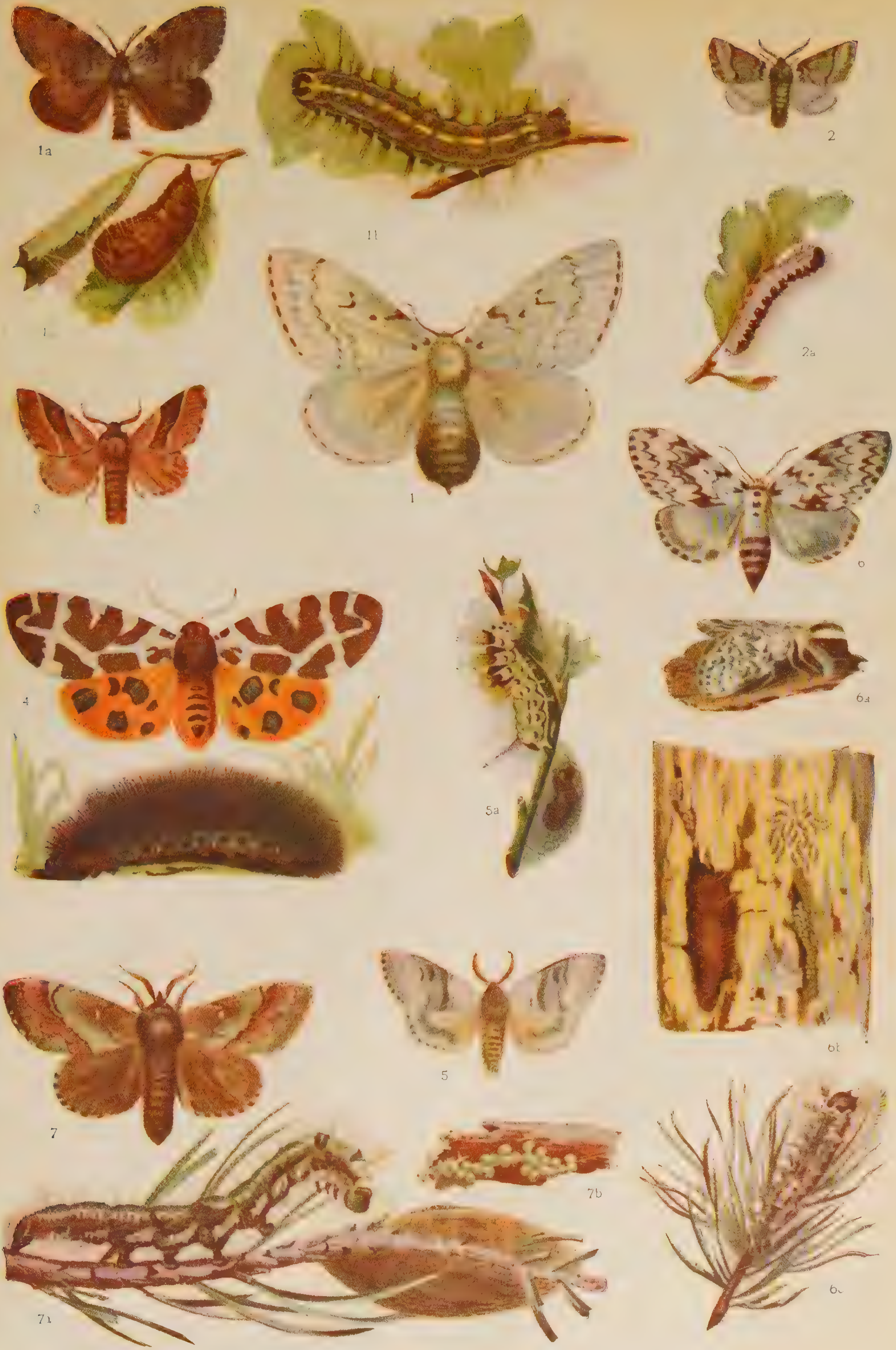
MOTHER-OF-PEARL. See PEARL.

MOTHER OF PRESIDENTS, in American history, a name given to Virginia because that State has given eight chief executives to the Union, namely: Washington, Jefferson, Madison, Monroe, Harrison, Taylor, Tyler and Wilson.

MOTHER OF STATES, in American history, a name given to Virginia, from the fact that out of the original colony of Virginia were formed the States of Kentucky, Ohio, Indiana, Illinois and West Virginia.

MOTHERS' CLUBS, organizations of women in various American cities designed to better the condition of the home and aiming to formulate improved methods for the moral training and education of children. They are active in promoting playgrounds, children's clubs, etc. The most prominent of these societies is the New York Mothers' Club. There is a New York State Federation of these societies which holds annual meetings.

MOTHER'S DAY. The honor of the origination of Mother's Day belongs to Miss Anna Jarvis of Philadelphia. Her mother died in 1906. On Sunday, 9 May 1907, she told a friend whom she had invited to remember with her the anniversary of the death of her mother of her desire to dedicate a day to all mothers. Before the next anniversary came she had interested many individuals and organizations in the observance of the second Sunday in May as Mother's Day. As a result of her efforts, Philadelphia observed the day, 10 May 1908. Miss Jarvis then became the missionary of the idea. She wrote thousands of letters to influential men in all walks of life. She interviewed many public men and pleaded for the observance of the day. Since 1912 the governor of Texas has observed the day by pardoning a number of prisoners on that day. State after State has adopted its observance. In May 1913 Pennsylvania made it a State holiday. On 10 May 1913 a resolution passed the Senate and the House of Representatives to make the second Sunday in May a national holiday, «dedicated to the memory of the best mother in the world, your mother.»



1. Gypsy Moth (Porthetria dispar), female; *a*, male; *b*, feeding caterpillar; *c*, pupa. 2. European Processionary Moth; *a*, feeding caterpillar. 3. Lackey Moth. 4. Tiger Moth and its "woolly bear" caterpillar. 5. Tussock Moth; *a*, caterpillar and cocoon with pupa. 6. Psilura Moth (Psilura monacha), female; *a*, male; *b*, eggs, young caterpillars and pupa, on the under side of a piece of bark; *c*, feeding caterpillar. 7. Pine Moth (Gastropacha), female; *a*, feeding caterpillar and cocoon; *b*, eggs.

Miss Jarvis has been the means of organizing a national and an international organization to further the promotion of the observance of the day. It began to be observed in England as early as 1913. The second Sunday in May is observed in all churches irrespective of creed, and the previous Friday is observed in all the public schools. The previous day is observed in business establishments. It is observed «through some distinct act of kindness, visit, letter, gift, or tribute to show remembrance of the mother to whom general affection is due.» It is also observed as Father's Day, and «is designed to perpetuate all family ties.» Its slogan is in honor of «the best mother who ever lived.» The badge of the day is a white carnation.

MOTHERWELL, mut'h'ĕr-wĕl, **William,** Scottish poet and antiquary: b. Glasgow, 13 Oct. 1797; d. there, 1 Nov. 1835. Educated at Edinburgh and Paisley, at 15 he was apprenticed to the sheriff-clerk of the latter town, and in 1819–29 was sheriff-clerk depute. It was while in this situation that he did his best work both as poet and ballad-collector. He was precocious, and planned his ballad, ‹Jeanie Morrison,› at the age of 13. After editing the collection of songs called the ‹Harp of Renfrewshire› (1819), he compiled the more important collection of ballads published in 1827, under the title of ‹Minstrelsy: Ancient and Modern,› with a historical introduction and notes. This brought him to the notice of Scott. He became editor first of the Paisley *Advertiser* (1828–30) and then (1830) of the Glasgow *Courier*. He published in 1832 original ‹Poems: Narrative and Lyrical.› In 1835 he collaborated with Hogg in an edition of Burns. In the same year he was summoned to London to give information to a special Parliamentary committee; here his health broke down and he died not long after. Some of his lyrics are familiar in anthologies.

MOTHERWELL, Scotland, a police and municipal burgh and manufacturing town in the county of Lanark, 12 miles southeast of Glasgow. It is of comparatively recent origin, and takes its name from three farms called High, Low and North Motherwell, which again derived their names from an adjoining spring, which in Roman Catholic times was dedicated to the Virgin Mary, and called the *Well of our Lady*, or *Mother's Well.* The inhabitants are chiefly employed in the neighboring coal-mines, iron and steel works, foundries and engineering shops. Motherwell has several churches, a town-hall, public park, good water supply, electric light, etc. Pop. 40,380.

MOTHERWORT, a labiate plant (*Leonurus cardiaca*) with rigid branched stem about three feet high, flowers in crowded axillary whorls, white with a reddish tinge, upper lip of corolla shaggy, calyx with spreading teeth; leaves with long petioles, lower ones palmately cleft, upper ones three-lobed. The plant, with two or three related species, frequents waste places, and is not uncommon in North America, where it has been introduced from Europe. An infusion of it was formerly much employed in chest diseases.

MOTIF, mō-tēf. See LEITMOTIV.

MOTION. See MECHANICS.

MOTION (from the Latin *motio* and the verb *movere,* to move). *In legal practice* it means an application to a court by one party in a cause, or his counsel, seeking a rule he considers necessary in the case or to obtain relief in summary manner from an injustice. This may be made in a written application or orally. In cases where the object of the motion may be granted on request and without a hearing it is a motion *of course,* such as an *ex parte* application; if notice is required for other party it is a motion *on notice.* A motion made on matter of fact has to be supported by an affidavit that such facts are true. There are also motions *for decree* and *for judgment,* etc. See DECREE; JUDGMENT.

MOTION, *in music,* is a term used to express a change of pitch in successive sounds, when they are allotted to a single part or voice, or to groups of parts or voices which sound simultaneously. In a single part the motions are classified according to whether the successive steps do or do not exceed the limits of a degree of the scale at a time; in the former case it is called «disjunct» and in the latter «conjunct» motion. When motions of different parts sounding together are independent it constitutes counterpoint, in which cases, according to their relations, we get «contrary,» «similar» and «oblique» motions. «Contrary» motions have their parts converge or diverge, one rising as the other falls. «Similar» motions either rise or fall together; while the «oblique» defines one part only moving up or down, the other standing still.

MOTION PICTURES. See MOVING PICTURES.

MOTION PICTURES, Censorship of. See MOVING PICTURES, CENSORSHIP OF.

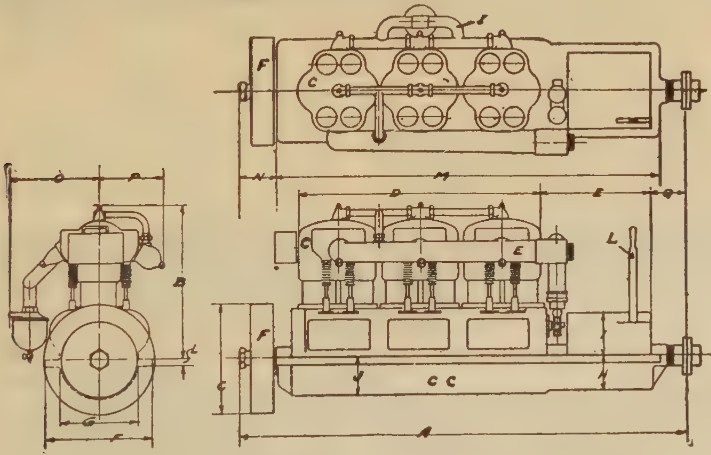
MOTLEY, mŏt'lĭ, **John Lothrop,** American historian: b. Dorchester, Mass., 15 April 1814; d. near Dorchester, England, 29 May 1877. His education was obtained at Harvard, from which he was graduated in 1831, and at the universities of Berlin and Göttingen, between which he divided two years (1832–33). His first published writings were contributions to Willis' *American Monthly Magazine* and «verses in the corner of a paper called the *Anti-Masonic Mirror.*» His first book, the two-volume, semi-autobiographical ‹Morton's Hope› (1839), met with a generally unsatisfactory reception; and, according to Holmes, the *North American Review* «dropped a small-print extinguisher upon it.» He went to Saint Petersburg in the autumn of 1841 as secretary to the American legation, but after a brief residence returned (1842). His first important attempt in history was a 50-page article, nominally a review but really a narrative, on Peter the Great, in the *North American* for October 1845 (in book-form in the ‹Half-Hour› library). His further literary work during this period includes notable essays on Balzac (July 1847) and the ‹Policy of the Puritans› (October 1849) in the *North American;* and a second effort of fiction, ‹Merry Mount› (1849), certainly an advance on the first, and rewarded by a nearly 20-page notice in the *North American,* but clearly not a success. But so early as 1846 he had been gathering material for a history of Holland. Having learned that Prescott, then at the height of his reputation, was busy upon the ‹History of Philip II,› Motley had a conference with Prescott, who urged him to continue, even though the two works would unavoidably cover the same ground. For the year 1849 he was a member of the Massachusetts house of representatives; and he often humorously referred to his experience when an extensive and, as he fancied, impregnable report prepared by him as chairman of the committee on education was triumphantly demolished by George S. Boutwell (q.v.), then a young representative from Groton. From 1851 until 1856, the year of the appearance of the ‹Rise of the Dutch Republic,› he was in Europe, continuing his investigations at Berlin, Dresden, The Hague and Brussels. When, after 10 years' labor, the great work was at last ready for the press, it had to be published at the author's expense. It was received with almost universal praise by public and critics — Froude writing, «one of the earliest as well as one of the most important recognitions»— and definitely established Motley's fame. It was widely translated, Guizot superintending the French version and writing the introduction. Motley was in America in 1856–58, but then returned to Europe. In 1861 he wrote two letters, then of great timeliness and importance, to the London *Times,* setting forth to the English nation the structure of the United States government, the causes of the Civil War and the results involved. From 1861 until his resignation in 1867 he was United States Minister to Austria, and his official dispatches in this post were highly praised by John Jay, his successor. He returned to the United States in 1868, in 1869 was appointed Minister to England by Grant, but in 1870 was suddenly recalled. This action by the government was never explained with any degree of satisfaction. The correspondence between Motley and Fish, Secretary of State, is to be found in a publication of the State Department (1871). It would appear that Holmes' verdict that Motley was greatly wronged is the correct one. Sumner said: «How little Mr. Motley merited anything but respect and courtesy from the secretary is attested by all who know his eminent position in London and the service he rendered to his country.» Motley continued writing until 1873, and in 1875 paid a visit to the United States. His other two famous works are the ‹History of the United Netherlands, from the Death of William the Silent to the Twelve Years' Truce, 1609› (1860) and ‹The Life and Death of John of Barneveld, Advocate of Holland: with a View of the Primary Causes of the Thirty Years' War› (1874). They confirmed his rank as a great historian; some of the best Dutch critics thought the ‹Barneveld› his chief publication. His style is precise and brilliant; his narratives are full of movement, his portraitures vivid. Consult Holmes, O. W., ‹John Lothrop Motley: A Memoir› (Boston 1898); Bassett, J. S., ‹The Middle Group of American Historians› (New York 1916); Curtis, G. W. (ed.), ‹Correspondence of John Lothrop Motley› (New York 1889); Mrs. S. St. J. Mildmay (Motley's daughter), ‹John Lothop Motlev and his Family: Further Letters and Records› (New York 1910).

MOTMOT, a bird of the tropical American family *Momotidæ,* allied to the kingfishers and todies, of which about 20 species are known, all in the genus *Momotus.* They inhabit the forests, as a rule, and are usually solitary in the daytime, perching with the head drawn between the shoulders, solemn and still except for an occasional melancholy croak from the repetition of which they derive their name, originally French and pronounced *mo-mo.* They are most lively at early morning and in the dusk of evening, pursuing insects in short flights; they also eat fruits, lizards and snakes, which are tossed into the air from the point of the bill and swallowed; they sometimes devour the eggs of other birds. The nest is made in holes of trees or banks of earth. The motmots are birds of brilliant plumage, with one striking peculiarity. The two middle feathers of the long-tail are much prolonged and are always more or less denuded of vanes on both sides of the shaft except near the tip, giving a racket-like shape to the feathers. This seems to be the result of a habit in the bird of gnawing its feathers, which begins as soon as their growth outreaches the other rectrices. The best-known species is the Brazilian motmot (*M. brasiliensis*), about the size of a blackbird, of a deep rich green color, with bluish forehead, violet back of head and black crown. One of the Mexican species (*M. cæruliceps*) occasionally crosses the line into the United States. Consult Belt, ‹Naturalist in Nicaragua› (London 1888) and *Zoologica* (Vol. I, No. 5, New York 1910).

MOTOR, a machine for utilizing some power, as gas expansion or an electric current, to do useful work. The meaning of the word «motor» is similar to the commonest meaning of «engine,» but the application of the words is different. We have become habituated to reserve the word engine for a steam-engine or large stationary gas-engine. The word motor came into common use with the commercial development of electricity. The makers of the first electric machine that was marketed for delivering power chose to call it an electric motor, and since then a reversed dynamo has always been a motor. Then came Daimler's perfecting of the «petrol» engine, for use on bicycles, which is now technically called an internal combustion engine, but popularly called a motor. The developments of this are the automobile motor, the aviation motor, Liberty motor, etc. Motor is now being used as a verb, as «to motor into town.» It has become fixed in the language.

MOTOR AREAS, those portions of the brain in which are located the cells that govern the voluntary muscles of the body. The motor areas are confined more distinctly to the cortex or outer surface of the brain on either side of the fissure of Rolando, making up the areas known as the anterior central and posterior central convolutions. In these areas are numerous motor cells, the stimulating of which results in bodily motion. From these motor cells the impulse passes inward through the substance of the brain. The motor cells may be isolated from adjoining surface area by excision, with no effect on the control of the specific motion. When these surface areas are removed or injured there follows an impaired function of the muscle corresponding to the cells or the fibres interfered with. The motor area in the right side of the brain controls the voluntary muscles of the left side of the body and the right hand and leg are controlled by the left side of the brain. The tracts of fibres that come from one side pass the middle line at the lower level of the medulla, the decussation of the pyramids. The motor area itself is subdivided into irregular areas or centres as they are loosely called — an arm-centre, a leg-centre, etc. In these more or less clearly delimited areas the cells governing the voluntary muscles of a leg or an arm are grouped. In much the same manner the nerves of the muscles of the face and of the eyes, tongue, etc., have their locations of origin in certain portions of this general motor area. There is, however, no evident relation between the size of a cortical area and the size of the mass of muscle which is controlled thereby. Thus the cortical area for the face and head is much larger than for the leg area which controls the many times greater bulk of the leg muscles. Irritation of the motor area usually causes excessive muscular movements or convulsions and destruction results in loss of motor power or paralysis. The experiments from which these facts are drawn were performed upon rabbits, dogs and monkeys. Some few of them have been confirmed in the course of surgical practice upon human patients. (See BRAIN; CONVULSIONS; PARALYSIS). Consult Howell, W. H., 'American Text-Book of Physiology' (Philadelphia 1903).

MOTOR BOATS, power boats equipped with internal-combustion engines, as distinguished from boats propelled by steam power. They divide into several groups or types: (1) the gasoline launch, commonly 20 to 30 feet long; (2) speed boats, sometimes called displacement speed boats, more or less decked over and with high-powered engines: they often run up to 40 feet in length; (3) hydroplane boats, having stepped planes in the hull and designed to slide on the water rather than through it; (4) cruisers, virtually pleasure yachts, using gasoline motor engines instead of steam engines and usually built with a view to speed. These last are commonly 60 to 100 or more feet in length, and they carry engines or sets of engines varying from 50 to 300 or more horse power.



Six-cylinder Internal Combustion Engine for Motor Boat. M — Overhead view; B — End: A — Side; I — Intake; E — Exhaust; L — Lever; F — Fly-wheel; C — Cylinders; CC — Crank Casing.

The hulls are built in several styles — round-bottom, flat-bottom, V-bottom, tunnel-bottom, etc., and with widely varying types of bow and stern. Of the former, the prevailing types are the straight, round, dory, spoon and clipper bows; of the latter, the square, round, transom, fantail and torpedo sterns. A straight bow has the most elegant appearance, but a round bow rides better and is preferable. A transom or V-shaped stern makes the fastest and driest boat. Open boats of the launch class have a few feet of deck forward and aft, with a narrow strip along the gunwales, and a five or six-inch coaming around the cockpit. They are often fitted with a spray shield of canvas or a «buggy-top» sun and rain shield. Larger boats are protected by an awning top carried on a frame overhead, or by a fixed «standing-roof» which is commonly fitted with side curtains of canvas, making a weather-tight inclosure, but dangerous in a high wind. Boats 25 to 30 (or more) feet in length usually have a cabin of some sort. This may be of the «raised deck» or «hunting cabin» type, inclosing the bow for several feet back, or a «glass cabin» inclosure toward the middle of the hull. The last is liable to make the boat top-heavy unless it has considerable width of beam.

At the Paris Exposition of 1889 there was exhibited a boat with a Daimler motor, this being among the first of the motor boats. As this form of motor was developed and improved for automobiles and aeroplanes, manufacturers adapted it to boats, and the internal combustion or gasoline engines built for motor boats are quite as efficient as those constructed for automobiles and motor vehicles. Not having the same weight restrictions, they are usually of heavier construction, and they are built up to large sizes. As arranged for motor boats, the internal-combustion engine is simpler than for automobiles. No radiator is required to cool the cylinders, the water-jacket of the cylinders being supplied by a continual current of fresh water taken in from beneath the hull;

and no change-gear for various speeds nor differentials are needed. The engine may be direct-connected to the propeller-shaft. Motors of two to six cylinders are in common use. In small boats the gasoline or fuel tank is placed forward to get it high enough to feed the carburetter by gravity. The exhaust is carried to a water-cooled muffler and thence outboard. The crank-shaft is run fore and aft and is coupled to the propeller shaft. The latter has thrust-bearings with steel balls to relieve the friction. The propellers are made with two or three blades and special forms of spiral blades are made for shallow and weedy water. Some 20-foot motor boats are made to run in one foot of water, the propeller being placed in a tunnel in the hull. Some propellers have adjustable blades, which can be positioned so as to rotate either right-hand or left-hand, though the driving is in one direction. This adjustment therefore fits the boat for either forward or backward motion. The more common method, however, is to have the propeller-shaft geared to the engine by a lever-operated reversing gear.

A familiar type of six-cylinder internal-combustion engine for motor boats is shown, in the diagram. The cylinders are cast in pairs and placed upright, as in an automobile, with the inlet pipes on one side and the exhaust on the other. The crank-shaft is cased in below. At one end is the fly-wheel, the reversing lever at the other. A 12-horse-power engine in a 30-foot boat may drive it 10 miles an hour or more; with 20-horse-power, 16 to 18 miles may be attained. Racers with 30 to 60 horse-power motors make 30 to 35 miles an hour, meaning in each case statute miles. Over considerable distances the speed shown is much less. For instance, in the Philadelphia-Havana 1,200-mile ocean race in 1910 the winner averaged less than eight miles an hour.

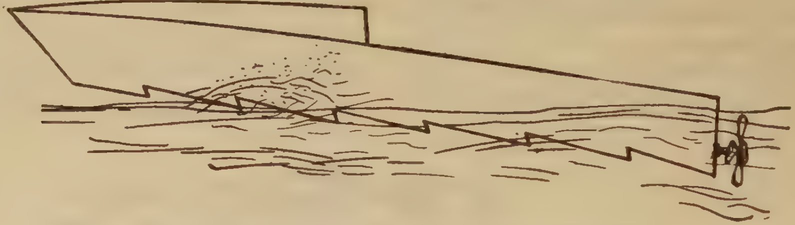


Diagram Illustrating the Principle of a Hydroplane Boat.

The small open boats employ mostly engines with one or two, and occasionally three cylinders. In these small engines the bore and stroke are about the same. In the larger engines, the stroke usually exceeds the bore by 20 to 30 per cent. The displacement speed boats commonly employ four-cylinder to eight-cylinder engines, while hydroplanes are built with four- to six-cylinder engines, up to 65 horse power or more. The large cruisers commonly install several motors tandem to get the desired horse power. In small boats the usual motor is of the two-cycle type; in the larger boats the four-cycle type is common, but by no means universal. The four-cycle motor is more economical of gasoline, and from a mechanical point of view is superior as a machine, but it is much more complex than the two-cycle motor, and is nearly twice the weight — the two-cylinder two-cycle motor having the same effective power as the four-cylinder four-cycle motor. For the ordinary motor boat no engine is better than the three-cylinder two-cycle motor. It runs with a minimum of vibration, and is of less dead weight for the power developed than any other. The ignition system is another fundamental feature upon which the motor boat operators and builders divide in opinion. The two systems in use are the make-and-break, and the jump-spark systems. Few who have had a serious amount of experience with both will hesitate to choose the make-and-break as the easiest to get along with in all circumstances. Most motor builders recognize this condition, and nearly every make of motor may be had with either system. Cabin motor boats, as a rule, are equipped with a storage battery, and a generator attached to the propeller shaft to keep it charged, thus providing the boat with a lighting system, and affording current for a searchlight to aid the pilot in making landings after dark.

Rowboats, canoes, dories and other small craft may be turned temporarily into motor boats by attaching to them a portable detachable motor made for such purpose. These little engines range from one horse power upward, and are provided with one or two cylinders, the latter type being more dependable. The motor is self-contained, and is simply clamped upon the stern board of the boat. It will drive an ordinary round-bottom rowboat six to seven miles an hour.

The hydroplane boat is of a distinct type, having a flat bottom or hull in the first instance, then a step being introduced in the hull, this being called a biplane hydroplane. This step construction involved a division in the bottom or hull, so that the forward half was a «step» lower than the aft half, this step being perhaps two inches high. This worked well, and the multiplane or multistep type was introduced and generally followed, as securing the best results. In its natural position the first plane of the hull is on the water level, and as the boat gathers speed the bow rises, and the entire boat is more or less lifted out of the water, tending to skim on top instead of to drag through the water, like other boats. But in order to rise upon the surface the speed must be very great; a slow boat will not «plane.» The highest authentic record up to 1 Jan. 1918, is that of the *Whip-Po'-Will* which averaged 69.39 miles per hour for six one-mile spurts on Lake George, 6 Nov. 1917; and made its fastest mile in 51.55 seconds — a rate of 70.15 miles per hour. Other fast records for 1917 were by *Miss Detroit II*, 61.72 miles per hour; and *Miss Minneapolis*, 49.27 miles per hour.

Motor boat races are held regularly at

1 30-foot runabout

2 40-foot cruiser

Monaco and many European water resorts; also in the United States, on the Hudson, off Marblehead, off Block Island, on the Mississippi and the Great Lakes. In the 1917 motorboat race from New York to Albany and return, a distance of 235 miles, the winner was *Luetta* with a record of 29 hours, 38 minutes, 26 seconds. In the Miami-to-Palm Beach, Fla., race in 1917, *Raven III* completed the 70 miles in 1 hour, 47 miles, elapsed time. Consult Durand, W. F., ‘Motor Boats’ (London 1907); Hobbs, E. W., ‘Model Power Boats’ (London 1912); Russell, T. H., ‘Motor Boats: Construction and Operation’ (Chicago 1910); Verrill, A. H., ‘Book of the Motor Boat’ (New York 1916).

MOTOR CAR. See AUTOMOBILE.

MOTOR CYCLE, a two-wheeled vehicle resembling the bicycle, propelled by an internal combustion engine slung in the frame between the wheels. The operator sits astride the frame on a saddle and steers the vehicle by handle-bars after the manner of the bicyclist. The engine, now usually of two-cylinders, is air-cooled. The power is conveyed to the rear through a transmission gear box by a shaft or sprocket chain. The later models of these machines dispense with the pedals which were employed to start the engine in the earlier machines. The right foot-rest of the modern machines carries a toothed sector which is used to turn the engine shaft in starting. The control and operation elements of the vehicle are analogous to those of the automobile. They comprise fuel throttle and spark controls, usually operated from the hand grips, clutch and speed gear shift levers, fuel and oil tanks, high tension magneto, carburetor, muffler, etc. A side car is frequently added, which virtually makes the machine a tricycle. Its comparative lightness, low cost of maintenance, light fuel consumption, has made it very popular. It is extensively used by traffic regulation officers on much-frequented highways.

MOTOR FUELS. See CHEMISTRY, PROGRESS OF.

MOTOR TRUCK, a heavy type of automobile developed for carrying truck or freight. At first they were called auto-trucks, and were simply stout automobiles, with wagon bodies, suiting them to carry goods. Because of the great weight on the rear tires these were doubled literally, two tires being placed on each rear wheel. For a few years truck-builders gave their attention mainly to bodies, building them to suit all sorts of trades, but employing a cheap heavy automobile chassis and motor. As the automobile proper was improved for speed, it became less suited to use for a truck, where slow speed and large carrying capacity were demanded. Heavy, slow-running motors were then designed, but the old chain-drive for the rear wheels was adhered to. Though this chain was called «silent» it was a noisy affair, and the entire motor truck of that date (about 1910) looks very crude now. In 1914 and 1915 the war demand for motor trucks aroused American builders to construct more efficient models, and the result is that now there are on the American market well over 100 makes of motor trucks, that wholly outclass the older types. The great majority run from one to six tons. A few 7- to 10-ton trucks are being built. For motors the four-cylinder is most common, though many six-cylinders are employed. There is no demand for a large number of cylinders, as in automobile and aviation motors. The typical motor-truck motor is often called an «engine» by the trade, because its design resembles small stationary and marine engines. Practice as to clutches varies, but the disc type predominates, this being well adapted to the slow speeds and heavy power transmission of the truck, though poorly adapted to a racing automobile. Roller-bearings are universal, Timkin and Hyatt being the familiar types. The chain drive has almost wholly given way to the improved worm drive, described and illustrated under automobile (q.v.). The four-wheel drive is increasing in popularity and numbers. Wheel bases tend to grow greater. The shortest seen on any 1918 truck was 124 inches on a small truck and 135 on a 6-ton truck, while the larger trucks of the best makes ran up to 163 to 180 inches wheel base.

The number of motor trucks and commercial cars in use in the United States in January 1922 was estimated to be 1,278,804. The number of commercial cars built in 1921 was 253,305, but these are not all properly designated as motor trucks, for many of them are light wagons for city express work. The light traffic is being taken care of in large measure by an attachment to the Ford car. A truck frame and rear wheels are arranged to be hitched on to the fore-wheels and motor of a Ford car; any sort of a wagon body can be placed on top. This combination has a carrying capacity of 1½ tons, utilizes heavy artillery wheels, 34 x 3½, including solid tires. The wheel base is 128, the loading space over nine feet long, and it sells at a very low price ready to attach to any Ford. This cheap truck is rapidly driving out the horse, and the estimate is that over 2,000,000 horses have at this date been released from servitude in the United States by the more than million and a quarter of motor trucks in use.

The wonderful tests to which motor trucks were subjected in the Great World War have been a prominent factor in the development of superior machines. Manufacturers have met the strain and built better than they ever built before, producing machines that stood amazing rough usage, on broken ground, in the rear of the Allied armies. The demands of the British and American governments for certain types developed the artillery type of truck, adapted to army conditions. Thousands of these machines were built in the West, and made their way to the Atlantic seaboard for shipment under their own power. On several occasions the great Lincoln highway witnessed processions of them miles in length, all going over to help win the war.

A considerable number of electric motor trucks have been built, and they operate very satisfactorily. Their traveling range is limited to about 50 miles, after which the batteries have to be recharged. The electric light and power companies, which charge the batteries, have not generally cared to cater to this business, so the electric trucks are not common, though they have been adopted by some large concerns.

A large heavy road motor truck is a good deal like a locomotive to care for. Before starting on a tour the driver must look it all over to make sure that everything is in working order. In making down grades he must remember that he has a great weight behind him and cannot lock the brakes and expect to stop. He must slow down his engine and use it as a resistance, and apply his brakes gradually. The use of heavy motor trucks involves trailers, which may be likened to small open freight cars designed to be drawn by the big truck, serving as a road locomotive. This combination gives us the long-sought independent train that can run on any fairly good road. It is beginning to be used, and will before many years be common on certain American highways given up mainly to trucking, for this heavy traffic surely means that the highways of the future must be separated, that fast driving automobiles and slow-moving heavy trucks with trains of trailers may not have to occupy the same route and interfere with each other. In some sections of the country this ideal has been partially realized.

MOTORS IN WARFARE. The various motors employed in military aeronautics, culminating in the «Liberty motor,» and the various motor trucks produced under specifications approved by the War Department Motor Transport Board were so constructed that the various units entering into the construction, including the engine, transmission, axles, springs, universal joints, frame, radiator and fan, were interchangeable as far as possible. This interchangeability of parts led quickly to the standardization requirements of the government which put an end to the complicated engineering, purchasing and manufacturing problems, to say nothing of the enormous cost of the finished products, due to lack of uniform manufacturing limits and patterns.

The Liberty airplane engine and the war trucks are not examples of standardization in the commercial sense, but of military designs dictated by war needs. The standardization by the government of the necessary designs of all kinds of self-propelled vehicles operable on land, sea or in the air, was one of the factors in determining the outcome of war. The so-called submarine chaser is another recent war product. The designs and construction of motors used in many of these submarine chasers constitute some of the most important problems of automotive engineers. The production of the boats by standardized processes has been a great achievement. The development of small stationary or semi-portable units for the operation of the wireless set, the searchlight, pumps, isolated electric lighting plants and machine tools in portable repair shops, is another of the matters handled by automotive engineers. These machines perform highly important functions in the great military organizations of modern times and those responsible for their design and operation deserve equal credit with those who have contributed to the more spectacular forms of modern warfare. The United States standard army truck is not a commercial 3-ton truck, but an excellent 5-tonner and its engine axles and transmission is commonly used for 5-ton assembled trucks. Its outstanding characteristics are exceptional power; good springing, making the riding almost as good as that on a passenger car; reasonable economy of fuel; ability to handle cold air and poor fuel without the least difficulty in starting and ease of steering and control. The complete truck with body, top, and equipment weighs a trifle over 10,000 pounds, and the chassis with driver's seat and in running condition scales 8,600 pounds. The engines have detachable heads and complete pressure lubrication is used. The following is a summary of principal points: (1) the engine has four 4¾ by 6 cylinders, cast in pairs, with detachable heads; (2) much attention has been paid to the cooling and lubrication problems; (3) force-feed lubrication is used throughout and the oil is doubly strained; (4) two entirely separate ignition systems, one battery, the other magneto, are used; (5) the crankcase, including the bell housing and the oil pan, is aluminum, three-point support being used; (6) the crankshaft is very rugged, and is notable for its large intermediate bearing, as long as the rear one; (7) the governor is the steel-ball type, and so enclosed and sealed that it cannot be tampered with; (8) there is a dry disc clutch, a four-speed horizontally arranged change gear, a work drive, a full floating rear axle and Hotchkiss drive.

There are two methods of transporting heavy artillery; one to pull the piece; the other, to carry it in one or two loads. Both have their advantages and disadvantages. It is naturally easier to pull the gun than to load it on the truck, but the pulling of the gun on the road behind a truck results in considerable wear and tear on the pieces. To reduce the latter, truck-pulling pieces do not go faster than from seven to eight kilometers per hour, and a great deal of care is taken to prevent injury to the recoil apparatus of the gun by collision, etc. Carrying the gun has the great advantage of permitting the truck to make from 10 to 15 kilometers speed. It is necessary to differentiate between these methods of movement and the movement of heavy tractor artillery. This latter artillery is actually formed in requirements and groups and includes all the necessary tractors and trucks for its complete unit and for the first supply of ammunition. The tractors of the group are all of the 4-wheel driven type instead of the 2-rear wheel driven, as is the case with all other tractors.

Edward S. Farrow,
Consulting Military and Civil Engineer.

MOTRIL, mō-trēl', Spain, town in the province of Granada, somewhat over a mile from the Mediterranean Sea. It is in itself a port but the anchorage harbor, Calahonda, to the southeast, is more important. The climate is very mild and its industries consist of sugar plantations, wine-culture, sugar mills; cotton also is grown to some extent. There are also iron foundries, soap works, etc. Pop 18,444.

MOTT, Alexander Brown, American surgeon: b. New York, 31 March 1826; d. Yonkers, N. Y., 12 Aug. 1889. He was educated privately by Professor Darling of the University Medical College and at Columbia College Grammar School, then (1836) went to Europe for five years continuing his education. Although a Quaker he entered West Point, resigning at his father's desire and became secretary of Commodore Morris in United States naval quarters on the Mediterranean. He next took up commercial life (1845) visiting Turkey, Greece, Italy and Austria for a Marseilles firm. Continuing the study of medicine at Havre, he returned to New York and was graduated (1849) at New York Medical College, at the University of Pennsylvania (1850) and Castleton Medical College. In 1853 he became visiting surgeon at Saint Vincent's Hospital and was attending surgeon (1855–63) to the Jewish Hospital. He was one of the founders of Bellevue Medical College. During the Civil War he was medical director (1862–64) at New York and (1864–65) inspector of the department of Virginia and was mustered out of the service in 1866 with rank of brevet-colonel. From 1872 he was professor of clinical and operative surgery till his death at Bellevue Medical College. He wrote 'Surgical Operations' (1856–57); 'Advantages of Clinical Teaching' (1868), and other works.

MOTT, James, American abolitionist: b. Cowneck, L. I., 20 June 1788; d. Brooklyn, N. Y., 26 Jan. 1868. He was a teacher in a Friends' boarding school in Dutchess County, N. Y., at 19, where he later married Lucretia Coffin. In 1810 he went to Philadelphia, Pa., and engaged in mercantile business. He was a staunch friend of William Lloyd Garrison (q.v.), assisted in the organization of the Philadelphia Anti-Slavery Society in 1833 and attended as a delegate the World's Anti-Slavery convention in London in 1840. He was a determined supporter of the cause of woman's rights and in 1848 presided over the first woman's rights convention at Seneca Falls, N. Y. From 1865 till his death he became interested in the foundation of Swarthmore College.

MOTT, John Raleigh, American Y. M. C. A. leader: b. Livingston Manor, N. Y., 25 May 1865. He was graduated (1888) at Cornell University when he was made chairman of the executive committee of the Student Volunteer Movement. Since 1895 he has also been general secretary of the World's Student Christian Federation and is now chief executive of the National War Council of Y. M. C. A. associations. On the retirement of Woodrow Wilson from the presidency of Princeton College he was offered the position but did not accept it. In 1916 he was appointed by President Wilson member of the joint commission for settlement of differences between Mexico and the United States and he was a member of the mission to Russia, headed by Elihu Root, in 1917. He has written 'Strategic Points in the World's Conquest' (1897); 'Evangelization of the World in this Generation' (1900); 'Christians of Reality' (1902); 'The Pastor and Modern Missions' (1904); 'The Future Leadership of the Church' (1908); 'The Decisive Hour of Christian Missions' (1910); 'The Present World Situation' (1914). In 1910 he had conferred on him the degree LL.D. by the University of Edinburgh and in 1911 the same degree by Princeton University.

MOTT, Lewis Freeman, American educator: b. New York, 29 Sept. 1863. He was educated in his native city and was graduated (1883) at the College of the City of New York, where he became tutor (1884–94) of English and (1894–97) instructor, then assistant professor and professor. He was elected (1911) president of the Modern Language Association. His profound studies of English and Romance literature and folk lore assisted him to the material of many lectures and he has written 'The System of Courtly Lore' (1896) and 'Provençal Lyrics' (1901). He has been editor of the *City College Quarterly* since 1906.

MOTT, Lucretia Coffin, American abolitionist and woman's rights advocate: b. Nantucket, 3 Jan 1793; d. near Philadelphia, 11 Nov. 1880. With her parents, Thomas and Anna Coffin, she removed to Boston in 1804, and two years later became a pupil in a Quaker boarding school at Nine Partners, N. Y., where James Mott (q.v.), whom she subsequently married was a teacher. In 1817 she opened a small school, but soon gave it up and became recognized as «an acknowledged minister.» She joined the Hicksite branch of the Quakers upon the schism of 1827. In 1833 she joined in the formation of the American Anti-Slavery Society, as whose delegate she went to the London World Convention in 1840, from which all women were excluded. The result was the woman's rights movement, in which Mrs. Mott became a leader, taking a prominent part in establishing the convention held at Seneca Falls in 1848. Consult Hallowell, A. D., and 'Letters of Lucretia and James Mott' (1884).

MOTT, Valentine, American surgeon: b. Glen Cove, L. I., 20 Aug. 1785; d. New York, 26 April 1865. He was graduated (1807) at Columbia College when he went to England to continue his studies in medicine at the post-graduate courses of London and Edinburgh. In 1809 he returned to New York and was given the chair of surgery at Columbia College, continuing to hold the position when Columbia College was merged with the College of Physicians and Surgeons. In 1826 he with the entire body of his colleagues resigned on account of offensive actions of the trustees and they founded Rutgers College. The latter institution, in 1830, had to close from defects in its charter and he returned to the College of Physicians and Surgeons as professor of operative surgery and surgical and pathological anatomy. Ill health caused him (1835) to resign to visit Europe twice, finally returning in 1841, after having gained high honors for work done in the old country. He was elected president of the medical faculty of the University of the City of New York while still practising as surgeon in New York Hospital, till 1850 when he spent a year in Europe. In 1851 he was appointed professor of operative surgery and surgical anatomy again at the College of Physicians and Surgeons for a year when he resigned and was made emeritus professor for the rest of his life. On his death his fine library went to New York Academy of Medicine. He gave but little time to literary composition, one of his most extensive works being his 'Travels in Europe and the East' (1842). He supervised a translation of Velpeau's 'Operative Surgery,' writing its preface. In 'Transactions' of the New York Academy of Medicine were published numerous addresses and lectures. He also wrote a 'Sketch of the Life of Dr. Wright Post' and a 'Eulogy on his friend Dr. John Wakefield Francis' (1861). 'Mott's Cliniques' (1860) is an abstract of his later clinical lectures.

Consult Gross, S. D., ‹Memoir of Valentine Mott› (Philadelphia 1868).

MOTTIER, mōt'tyĕr, **David Myers,** American botanist: b. Patriot, Ind., 4 Sept. 1864. He was graduated (1891) at Indiana University, then took the Ph.D. degree at the University of Bonn in 1897 and at Leipzig in 1898. He was (1891–93) instructor of botany at Indiana University and associate professor (1893–98), then professor from 1898. He was elected president of the Indiana Academy of Science in 1907. He has written ‹The Practical Laboratory Guide for First Year in Botany› (1902); ‹Fecundation in Plants› (1904), as well as a number of technical papers on botany.

MOTTLED OWL, a small horned owl (*Megascops,* formerly *Scops, asio*), which, in one or another geographical variety, occurs numerously all over the continent, except in the colder parts of Canada. Very similar species are known in Central America and in Japan. It is only 9 or 10 inches long, with large facial discs, two small erectile horns and a short rounded tail. Its plumage is a mottling of gray and rust-red. These little owls are nocturnal and are almost blinded by daylight glare. They come out in the dusk of evening, and from sunset to darkness, or all night when the moon is shining, is heard their low, musical, trilling cry — one of the pleasantest of bird voices; yet in some evil way the name *screech-owl* was long ago fastened upon this bird. Its eggs are five to seven, pure white. The food of the mottled owl is chiefly small rodents and insects, and occasionally, in spring, small birds; they destroy a vast number of insects and mice hurtful to the farmer and gardener. Books upon American birds abound in facts as to their habits.

MOUCHEZ, moo-shā, **Amédée Ernest Barthélemy,** French astronomer: b. Madrid, Spain, 24 Aug. 1821; d. Wissous, France, 25 June 1892. He was educated in the French Naval Academy and remained in the navy until 1878 when he was appointed chief of the National Observatory. He had previously shown himself a brilliant scientist and particularly distinguished himself in coast surveys of Algeria and Brazil as well as in the observation of the transit of Venus in 1874. He bent all his energies to the improvement of the observatory, introduced several innovations of value, and was the originator of the international photographic chart of the heavens. In 1880 he was appointed rear-admiral. He wrote ‹Côtes du Brézil (1869–76); ‹La Photographie astronomique et la carte du ciel› (1877); ‹Rio de la Plata› (1873; 3d ed., 1891).

MOUFLON, moof'lŏn, or **MUSIMON,** a wild sheep (*Ovis musimon*) of Corsica and Sardinia, where it wanders about the summits of the mountain ranges in small flocks, and offers excellent sport. It is a question whether this species ever existed on the mainland, one opinion being that it arose in the isolation of the islands; but most naturalists believe that it formerly existed in Spain. The rams are about two and one-quarter feet tall at the withers, and have very large coiled horns, but the females are hornless. The long mane-like hair that covers the neck and chest of the rams is gray, but the remainder of the coat is mainly rust-red above and white on the ventral surfaces. A similar «mouflon» inhabits Cyprus; and the Barbary aoudad (q.v.) is often called «ruffed mouflon.» Consult Aflalo ‹Sport in Europe› (London 1901).

MOUKDEN. See MUKDEN.

MOULDING or MOLDING. See FOUNDRY PRACTICE.

MOULDS. See FUNGI.

MOULE, mool, **Handley Carr Glynn,** English bishop: b. Dorchester, Dorsetshire, 1841; d. 8 May 1920. He was educated at Cambridge University, took orders in the Anglican Church, and was an assistant master at Marlborough College 1865–67. From 1873 to 1876 he was dean of Trinity College, Cambridge, and he was first principal of Ridley Hall, Cambridge, 1881–99. He was nine times select preacher at Cambridge and once at Oxford, was Norrisian professor of divinity at Cambridge 1899–1901 and in the last-named year was consecrated bishop of Durham, succeeding Bishop B. F. Westcott (q.v.). He has published many devotional and expository works, among which are a series of commentaries on the Epistle; ‹Thoughts on Christian Sanctity›; ‹Ephesian Studies› (1900); ‹The Secret of the Presence› (1900); ‹Thoughts for the Sundays of the Year› (1901); ‹The School of Suffering› (1905); ‹Christus Consolator› (1915); ‹The Call of Lent› (1916).

MOULIN, an opening from top to bottom of a glacier, by means of which a stream flowing on the surface of the ice plunges to the bottom and flows on as a subglacial stream.

MOULIN ROUGE, moo'lăn'roozh, Paris, the «Red Mill,» noted dance-hall on the right bank of the Seine, in the Montmartre district. Since the notorious Jardin Mabille, in this section, went out of existence the Moulin Rouge has been the favorite resort for can-can and other gay dances of the Parisians.

MOULINS, moo'lăn', France, capital city of the department of Allier, on the right bank of a river of the same name, which is spanned here by a beautiful bridge, built in 1763. It is the junction of the Lyons and Orleans railways, and contains the old Gothic cathedral, built in 1465–1507 and finished by Viollet-le-Duc in 1861, and holding a triptych by Ghirlandajo among other art treasures. Here also are an ancient monastery church with monument of the executed (1632) Duke Henry II of Montmorency, a modern Gothic Sacred Heart (Jesuit) Church, the 15th century clock-tower, ruins of the 14th century castle of the dukes of Bourbon, a palace of justice, town-hall, etc. Its industries include factories for woolens, tools, agricultural instruments, paper, bells, hats, oil and vinegar. It is the seat of a bishop and has a court of assizes, a chamber of commerce and two lycées, besides a seminary, two divinity colleges and museums of natural history, art and antiquities. There are also a large library and theatre. Pop. 21,990.

MOULTON, mōl'tŏn, **Ellen Louise Chandler,** American poet: b. Pomfret, Conn., 10 April 1835; d. 10 Aug. 1908. She was married to William U. Moulton, a Boston publisher, in 1855 (d. 1898). She had a wide literary acquaintance both in this country and in England where she spent a part of every year for many seasons. Her weekly receptions both in Boston and London were the resort of many literary and artistic persons. She published such books for children as ‹Bedtime Stories› (1873–80), while her other writings include ‹Some Women's Hearts› (1874); ‹Miss Eyre from Boston› (1889); ‹In the Garden of Dreams›; ‹Lyrics and Sonnets› (1890); ‹Lazy Tours in Spain and Elsewhere› (1896); ‹At the Wind's Will,› verse (1899), etc. Her lyrics are extremely musical and as a sonneteer she ranks high.

MOULTON, Forest Ray, American astronomer: b. Le-Roy, Mich., 29 April 1872. He was graduated (1894) at Albion College and took (1899) the degree Ph.D. at the University of Chicago. He was appointed (1898) associate in astronomy of the University of Chicago, becoming (1900) instructor and (1903) assistant professor, associate professor of astronomy (1908) and professor (1912). He has been associate editor of *Transactins of the American Mathematical Society* since 1907 and research associate at Carnegie Institute since 1908. He has written ‹Celestial Mechanics› (1902); ‹Introduction to Astronomy› (1905); ‹Descriptive Astronomy› (1911); ‹Periodic Orbits› (1913), besides contributing numerous articles to the mathematical and astronomical periodicals.

MOULTON, Richard Green, Anglo-American educator: b. Preston, England, 5 May 1849; d. England, 15 Aug. 1924. He was graduated from the University of London in 1869 and at Cambridge University in 1874. After which he was associated with the university extension movement of various American and English universities. He was connected with the University of Chicago from its foundation in 1892 until 1919. After 1901 he was professor of literary theory and interpretation and head of the department of general literature. He published ‹Shakespeare as a Dramatic Artist› (1885); ‹Shakespeare as a Dramatic Thinker› (1907); ‹The Ancient Classical Drama› (1890); ‹The Literary Study of the Bible› (1896); ‹A Short Introduction to the Literature of the Bible› (1901); ‹The Modern Reader's Bible› (1895–1907); ‹World Literature› (1911); ‹The Modern Study of Literature› (1915).

MOULTRIE, mōl'trĭ, **John,** English poet and clergyman: b. London, 1799; d. 1874. He was educated at Eton and was graduated (1822) at Trinity College, Cambridge. He abandoned his law studies to be ordained (1825) in the church and went to Rugby (1828) as rector, while Thomas Arnold was head master of the school and with whom a close friendship grew up, as his poems testify. He wrote ‹My Brother's Grave› (1820); ‹Godiva› (1820), which is considered his best work. His collective works were published in 1876.

MOULTRIE, William, American soldier: b. South Carolina, 1731; d. Charleston, S. C., 27 Sept. 1805. He early allied himself with the military forces of the colonies and in the war with the Cherokees in 1761 the confidence of his fellow citizens in his ability was shown by his selection as captain of the body of troops raised to defend the frontier against the Indians. At the outbreak of the American Revolution in 1775 he was appointed colonel of the 2d colonial regiment and he also served as member of the South Carolina provincial congress in that year. He was engaged in the seizure of the public arsenals and the construction of fortifications around Charleston, and in March 1776 was ordered to construct a fort on Sullivan's Island. This he made of the only material at hand, palmetto logs, and when General Lee made an inspection he expressed his disapproval of the work, considering it totally unfit for the purpose of defense and advised its abandonment. Moultrie, however, continued the work and when an attack was made by the British fleet under Sir Peter Parker the rude fort successfully withstood all assaults and was subsequently named for its brave commander. He was promoted to the rank of brigadier-general in recognition of his services and given command of the forces in South Carolina and Georgia. So complete had been the defeat of Parker, however, that Charleston was not again attacked until 1779 when the British availed themselves of the absence of a large share of the Continental force and attacked the town. The return of General Lincoln saved the city, but in the spring of 1780 a third attack by land and sea compelled capitulation. Moultrie was held a prisoner for two years and though offered rank and money to enter the British army remained loyal to the cause of the colonies. Release came in 1782, when he was exchanged for Burgoyne, and though promoted to the rank of major-general it was too late for him again to engage in active service. He was elected governor of South Carolina in 1785 and in 1794, and published in 1802 ‹Memoirs of the Revolution.›

MOULTRIE, Fort. See Fort Moultrie.

MOUND BIRDS, a group of Australasian gallinaceous birds remarkable for the large mounds which they build as incubators for the eggs. See Megapodes.

MOUND BUILDERS AND MOUNDS. Two terms that have been inseparably connected by investigators into the history of these early earthen pyramidal, terraced and mound structures of the North American Indians. In the broader sense, mounds, especially in their connection with mound builders, include not only pyramidal structures and mounds proper, but also walls, forts, embankments and like artificial structures especially those built of earth. Archæological investigators also include among the mounds the accumulations of débris which grew up near ancient centres of population through the gradual increase of dump heaps or other long continued deposits.

The ancient American mounds seem to have been destined for a variety of uses; some of them were burial places, others foundations for edifices, still others served as fortresses, while the most pretentious were used for sacrificial and other religious purposes. From the Canadian border to southern Peru stretch pyramids (generally truncated), terraces and tumuli of various forms, sizes and modes of structure. That the builders of the various sections of this vast chain of artificial structures were related ethnologically, racially or by political contact has never been clearly proved and may never be. At one time it was popular to maintain that the builders of the great American mounds were a people distinct from the Indians inhabiting the United States territory at the time of the first contact of the Europeans and the aboriginal Americans. Bryant sang of the myterious lost race, and romances and sober scientific works were written about them. Now scientific criticism has swung to the opposite direction and not only is the existence of such a race denied but it is claimed that ancestors of the modern American Indian were the mysterious mound builders. But the last word has by no means been said upon the subject. The fact that Indian chiefs were found with their dwellings erected upon the summits of mounds is no proof that they built the mounds. Even if they did build small mounds as bases for their dwellings or as burial places for their dead, this again is no proof that their ancestors built vast structures like Cahokia, whose very existence presupposes politically organized society and the command of vast supplies of labor for long periods of time. As the Indian races of the North American continent seem to have been, for ages, given to migrations, the chances are rather against than for the modern theory that the ancestors of the modern United States Indians built the older and more monumental of the great mound structures, which must have served a race much further advanced in political and social organization than those to whom their construction has been attributed by those who hold the modern origin theory.

Shapes and Sizes.— The mounds are generally conical, hill-like structures, though some of them approach more or less closely to the true truncated pyramidal form and these vary, in the United States, from a few feet in height to over 100; and southward, throughout Mexico, Central and South America, very formally constructed pyramidal mounds exist that are over 100 feet in height and of vast proportions. The mounds of the United States which stretch from Canada to the Gulf of Mexico, down the Mississippi Valley and far across the plains on either side present a wide variety of forms. Conical, square-based, octagonal and other shapes add variety to the construction of the mounds proper; and forms of serpents and other reptiles, mammals and birds of gigantic size add to the impression of the civic culture of the races who conceived and constructed them. There can be little doubt that the more spectacular of these vast earthen structures were intimately connected with the religious beliefs of their builders. Eagles, panthers, serpents and other animal forms from 500 to 1,000 feet in length are among these mound structures, which include representations of many animals later known to have been totem signs among the American Indians over a very wide extent of territory. For this reason the theory has been advanced that these animal mounds were representations of tribal totems; and as such, probably served as emblems worshiped as protecting tribal deities.

Great Serpent Mound.— Of these animal form structures one of the largest and most noted is the Great Serpent Mound in Adams County, Ohio, which contains 1,350 feet of wall and is so constructed that it might, at one time, have formed a defensive work. The central folds of the serpent make two fort-like enclosures open only at the back; while the coil of the tail, which is whorl-shape, is especially well arranged for defensive purposes, the swollen head and neck, the outline of which is formed of earthen walls, constitute a very extensive fort-like structure, divided in two parts by a wall similar to that of the rest of the structure. Within the larger of these two divisions is an oval enclosure of considerable extent formed by earthen walls similar to those of the rest of the edifice. In the outer wall of the head section is an opening leading into the larger subdivision; but the other sections and the oval enclosure are without openings of any kind. The whole structure is admirably laid out for defensive purposes. It may, and probably did have a three-fold purpose, defense, totemic representation and religious signification. The wall is now only five feet high, but it may have been originally somewhat higher.

Situation of Chief Mounds.— In the United States there are still a vast number of mounds; and in the State of Ohio there were, at one time, thousands. The smallest of these, however, have disappeared or are rapidly being leveled to the ground by the ploughman. Some groups of mounds, like those that formed the basis for a part of the city of Saint Louis, Mo., have been leveled and built up over. In Wisconsin are large numbers of mounds representing the forms of animals, while in Tennessee are smaller mounds which were used for burial purposes, as is clearly proved by the stone graves they contain. Some of these seem to have been either community, tribal or family burial places, as considerable numbers of graves have been found in a single mound. Burial tumuli were also erected in Illinois, Minnesota, Mississippi, Indiana, Florida, Wisconsin, Virginia, Kentucky and Missouri. The mountain ranges seem to have set a limit to the mound builder activity which did not extend to the east of the Alleghenies, North Tennessee and North Carolina. Some of the mounds of the mound-building regions were old when they first became known to the white explorers, but how old is not known. Indian races in various parts of America were still occupying mounds a century after the discovery of America and some of them were constructing them both for burial purposes and as foundations for buildings; but it seems to be uncertain whether any of these later constructions were used for religious purposes. Some tribes are also known to have built, in historical times, miniature mounds in their great council houses, apparently as a part of a religious ceremony. This calls to mind the fact that the Mixtecas and Zapotecas represented the sacred mound as the symbolical presentation of the «heart of heaven.»

Among other tribes the custom obtained of collecting the bones of the dead, cleaning them carefully and burying them in a common grave over which a mound was erected.

It is evident from the great variety of mound structures that they could not have all been constructed by the same tribe or race and that the erection covered a very considerable period of time most of which was comprised in the later Stone Age of which some of the mounds show some beautiful workmanship; but nothing in metal except that introduced into them later of European make, and a few things probably obtained by barter from southern races.

Cahokia Mound is the largest prehistoric artificial earthwork in the United States. It is in Madison County, not far from Saint Louis; it lies in the American bottoms and is surrounded by a number of smaller mounds which Brackenridge, who visited Cahokia and the complete mound neighborhood in 1811, asserts then numbered 45, exclusive of a great many smaller elevations. These probably did not include the mounds that existed at one time on the site of Saint Louis, Mo., and which gave that city the title of the «Mound City.» The Cahokia truncated pyramid, for such it really is, measures about 1,000 feet from north to south, 725 from east to west, and 100 feet high at its greatest elevation. But the level top of the mound is not all at the same elevation. In fact one section of it is only 30 feet high, another is over 60 feet, while a third and fourth are slightly lower than the summit. The total Cahokia terrace measures about 200 feet by 500 feet. It thus affords considerable space, nearly two and one-half acres, which was probably used as a foundation for edifices. The base of Cahokia covers 17 acres, or over 40 per cent more than Cheops, the greatest of the Egyptian pyramids. Situated in the midst of a very populous district, and commanding the great «bottoms» from which rose scores of mounds of all sizes, Cahokia must have presented an inspiring sight in the days of its prosperity and might. The great pyramid was constructed of earth, which was taken from the country surrounding it, as is evident from the depressions in the soil. Cahokia is sometimes called Monks' Mound because it was occupied for a considerable time, from the beginning of the 19th century on, by Trappist monks, who had a vegetable garden on the top of the mound. Next to Cholula (q.v.), Cahokia is the largest based artificial pyramid in North America.

Etowah Mound, a large prehistoric mound three miles southeast of Cartersville, in Bartow County, Ga. Like the Cahokia mound it is situated on a river bottom and is surrounded by several smaller mounds of which it seems to have been the centre of community or civic life. Etowah is a quadrilateral, truncated pyramid much like Cahokia in form. It is over 60 feet high with a base length on one side of 380 feet. On the south side of the mound broad inclined roadway leads up to within 18 feet of the summit. This incline once was provided with wooden steps. The truncated top of the mound measures 170 by 176 feet. On the east side there is also a narrow slide reaching from the top to the bottom. The base of the pyramid covers nearly three acres. In excavations made in some of the surrounding mounds, stone images and copper plates have been encountered. Earthenware, copper, celts, pipes and stone objects suggestive of a fair degree of culture were also unearthed.

Elephant Mound, a well-known mound of massive form originally believed to represent some prehistoric animal probably an elephant. It is situated about four miles south of Wyalusing, Wis., on low ground a few feet above the level of the high-water mark of the Mississippi. The dimensions of this mound, which is badly disfigured through cultivation, is given as follows by the Bureau of American Ethnology; length 140 feet, height about four feet, width across the body to the lower end of the hind leg 72 feet. The bureau, upon careful examination, decided the mound was intended to represent a bear.

Fort Ancient, a prehistoric American mound fortification in Warren County, Ohio, and on a headland nearly 300 feet high overlooking the Miami River. The fortress itself is divided into two unequal portions known as the «Old Fort» and the «New Fort» and altogether it encloses a space of about 100 acres. The wall, for the most part, is constructed of clay but it is underlaid, in many places, with stone. This great wall is nearly 19,000 feet or more than three and one-half miles long and from 6 to 10 feet high and contains as much earth as the great pyramid of Etowah. Not far to the east of the «New Fort» are two mounds, and within the fort itself were other small mounds which evidently served as burial places. Most of the property covered by Fort Ancient has been secured by the State of Ohio by which it has been made a park and reservation placed in the care of the Ohio Archæological and Historical Society.

Grave Creek Mound, near Moundsville, W. Va., at the junction of Grave Creek and the Ohio River, is one of the best known of prehistoric Indian mounds. It is conical in shape with a base diameter of 320 feet, and a dish-shaped depression at the top. During excavations made in 1838 two burial vaults were uncovered, one at the base and the other 30 feet above. The lower contained two skeletons and the upper, one. Buried with the skeletons were several thousand shell beads, mica ornaments, stone objects and several copper bracelets.

Newark Works, near Newark, Ohio, an extensive group of prehistoric Indian constructions of a complicated nature. They are situated on an elevated plain from 30 to 50 feet above the river bottom and are composed of walls, circles, squares, an octagonal enclosure, ditches, mounds and avenues covering about four square miles. Two groups two miles apart are connected by avenues bordered by walls. The western group contains a large walled octagon and a square connected by a walled passageway; and the eastern group contains another large circle connected with a large square by a wide walled avenue. While the square enclosures have, each, several entrances, the circles have only one each and that leading into the square. The larger circle has a diameter of over 1,000 feet, and embraces within its circuit the fair grounds of the Licking County Agricultural Society.

Bibliography.—Allen, ‹Prehistoric World› (1815); Hodge, ‹Handbook of American Indians› (1912); Drake, ‹Pictures of Cincinnati› (1815); Lapham, ‹Antiquities of Wisconsin› (1885); Howe, ‹Historical Collections of Ohio› (1898); MacLean, ‹The Mound Builders› (1897); Moorehead, ‹Fort Ancient› (1890); Peet, ‹Emblematic Mounds› (1878); Shepherd, ‹Antiquities of Ohio› (1887); Squier and Davis, ‹Ancient Monuments of the Mississippi Valley› (1847); Thomas, ‹Burial Mounds of the Northern Section of the United States› (1887); ‹Mound Explorations› (1894).

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MOUND CITY, Ill., city, county-seat of Pulaski County, on the Ohio River, and on the Illinois Central and the Cleveland, Cincinnati, Chicago and Saint Louis railroads, about 200 miles south of Springfield and eight miles north of Cairo. It is in an agricultural section, but the principal industries are connected with manufacturing and trade. The chief manufactures are furniture, pumps, staves, headings and other lumber products, boxes, trunks, ice, foundry and machine-shop products. It has considerable trade in its own manufactures and in farm products, and has one of the largest preserving and canning factories in the United States. A National Cemetery, located here, contains 5,310 graves, of which 2,732 are unknown dead. Pop. 2,837.

MOUND CITY, Mo., city in Holt County, on the Chicago, Burlington and Quincy Railroad, about 40 miles north by west of Saint Joseph. It is situated in a fertile agricultural region in which farming and stock raising are the chief occupations. Its principal manufactures are milling, canned fruits and vegetables and dairy products. Its trade is in farm products and live-stock. In the vicinity are numerous mounds belonging to the age of the Mound Builders (q.v.). Pop. (1920) 1,472.

MOUNDSVILLE, W. Va., city and county-seat of Marshall County, and the seat of the State Penitentiary, on the Ohio River and on the Baltimore and Ohio and Ohio River railroads, about 12 miles south of Wheeling. It is situated on a point of land, about three miles wide, at the confluence of the Big and the Little Grave creeks. It was once called Grave Creek Flats, and at first there were two small villages called Elizabethtown and Moundsville. The present name is on account of the Mammoth Mound in the centre thereof, one of the largest ancient mounds in the United States. In the vicinity are other mounds classed as the Grave Creek group of mounds. The Mammoth Mound is connected with a series of earthworks of ancient construction and is 820 feet in circumference at the base, 63 feet in diameter at the summit and about 70 feet in height. It is now owned by the State and beautifully cared for. In the chambers have been found a stone tablet, the hieroglyphics thereon are yet undeciphered; the stone was sent to Europe for the purpose of determining the meaning of the marks and returned and is now in Smithsonian Institution, Washington, D. C. Shell beads, ornaments made of mica, others carved in stone, copper bracelets and other ancient articles have also been found. Moundsville is in an agricultural and coal region and the industries are connected with farming and coal mining. It manufactures also glass, enameled ware, bricks, lamps, ceilings, brooms, whips, cigars, clothing, flour, feeds, leather, etc. Pop. (1920) 10,669.

MOUNET, moo'na', **(Jean) Paul,** French actor, brother of Jean Mounet-Sully: b. Bergerac, Dordogne, 1847. He studied medicine and received the degree of doctor of medicine; first appeared in ‘Horace’ at the Odéon in 1880. In 1889 he first played at the Comédie Française, of which he was made sociétaire in 1891. He also served as professor at the Conservatoire de Paris and was made a chevalier of the Legion of Honor. His reputation was made in ‘Les Erynnyes,’ ‘L 'Arlésienne,’ ‘Othello,’ ‘Patrie,’ ‘Hamlet,’ ‘La Furie,’ ‘Anthony,’ ‘Le Roi,’ ‘L'Enigme,’ ‘Le Dédale, and ‘Œdipe Roi.’

MOUNET-SULLY, moo'nā' sü-lā, **Jean** (Jean Sully Mounet), French tragedian: b. Bergerac, 1841; d. Paris, 2 March 1916. His precocious attraction to the theatre was resisted by his family and it was not until he became of age that he entered the Conservatoire, where he won the first prize for tragedy, and made a successful first appearance at the Odéon in 1868. During the Franco-Prussian War he was an officer in the Gardes-Mobiles. In 1874 he became a member of the Théatre Française and remained in the company until he became its dean. Nature had endowed him with a most expressive face, a voice which had a convincing tone and a gift of gesture. He was made a chevalier of the Legion of Honor in 1889, and was decorated with the «Palmes Académiques.» His chief successes, although he essayed ‘Hamlet,’ were in the tragic rôles of French classic drama. His production of ‘Oedipe Roi’ at the old Roman theatre of Orange was his most notable achievement. It was repeated in Paris in 1888 and in New York some years later. With Barbier, he wrote ‘La Vieillesse de Don Juan’ (1906) in which he played the title rôle. Consult Brander Matthews ‘The Theatres of Paris’ (New York 1880).

MOUNT, William Sidney, American painter: b. Setauket, Long Island, 26 Nov. 1807; d. there, 19 Nov. 1868. He studied at the National Academy, N. Y., and became a member in 1832. His power as a genre painter was first proved by ‘Corn Husking’ although he had aroused interest by his ‘Raising of the Daughter of Jairus’ (1828) and a number of striking portraits, including a full-length of Bishop Onderdonk. He may be looked upon as the founder of the American school of genre, and is particularly happy in his treatment of negro characteristics. He has a genuine sense of humor and his ‘Bargaining for a Horse’ (New York Historical Society); ‘Raffling a Goose’ (Metropolitan Museum); ‘A Long Story’ (Corcoran Gallery, Washington): ‘Coming to the Point’ (New York Public Library) are real pictures of American life.

MOUNT AUBURN, a celebrated burial-place in Watertown, Mass., covering over 100 acres. Here are the graves of Longfellow, Lowell, Sumner, Phillips Brooks and other well-known men.

MOUNT CARMEL, Ill., city, county-seat of Wabash County, on the Wabash River, and on the Cleveland, Cincinnati, Chicago and Saint Louis and the Southern railroads, about 35 miles northwest of Evansville, Ind. The place was settled in 1818 and in 1868 was chartered. It is in an agricultural section; but the good water-power has contributed toward making it a manufacturing city. The chief public buildings are the courthouse, public library and High School building. The chief manufactures are flour, paper, lumber, furniture, lumber products, strawboard, machinery supplies, shafting, pulleys and dairy products. It has the railroad shops of the «Big Four» railroad. There is considerable trade in manufactured articles, farm products and livestock. Pop. 6,934.

MOUNT CARMEL, Pa., borough in Northumberland County, on the Pennsylvania, the Philadelphia and Reading, and the Lehigh Valley railroads, about 45 miles north by east from Harrisburg. It is in a mountainous region in the midst of valuable coal fields, and nearby are a number of large anthracite mines. The manufactures are mining implements, miners' lamps, hats, caps, cement blocks, men's clothing, flour and cigars. There are also a planing mill, silk and knitting mills, foundries, meat packing plant and wagon works. The borough has an extensive trade in lumber and coal. Pop. (1920) 17,469.

MOUNT CARROLL, Ill., city, county-seat of Carroll County, on the Chicago, Milwaukee and Saint Paul Railroad, about 25 miles southwest of Freeport and 10 miles east of the Mississippi River. It is situated in an agricultural and stock-raising region, and in the vicinity are deposits of iron ore. It is the seat of the Frances Shimer School, and it has a high school and Carnegie library, Caroline Mark Home for Aged Ladies. The water-supply system is the property of the municipality. Pop. (1920) 1,806.

MOUNT CLEMENS, Mich., city, county-seat of Macomb County, on the Clinton River, and on the Grand Trunk Railroad, about 22 miles northeast of Detroit. Electric railroad lines connect the city with Detroit and the towns along the coast. The first settlement was made in 1802; and the original plan of the village was made in 1818 by Christian Clemens. This first plat consisted of 60 lots now in the business centre of the city. The cooperage business was most important in the early days; the staves and heads for oil casks and barrels being made in Mount Clemens and shipped to large oil firms in New Bedford, Mass. Then Mount Clemens was considered the most important place in Michigan; but with the decay of whaling and whale-oil industries, the cooperage business declined and the town was at a standstill for several years. In 1865 a company prospecting for oil sank a well at Mount Clemens. After going to a depth of about 1,300 feet they abandoned all hope of oil, but found salt instead. Soon a new company was formed for the purpose of manufacturing salt, but the enterprise did not prove a success because of the quality of the salt. In 1868, apparently by accident, the discovery was made that the water from the salt wells possessed remarkable medicinal properties and since then the place has had a steady growth which is increasing each year. Large sanatoriums, hotels and bathing places have been built to accommodate the thousands of people who annually visit the place seeking health. The mineral waters, classed as sulpho-iodo-chromo-salines, as they come from the wells are about 50° F., and very rich in mineral salts, chiefly chloride of sodium and chloride of magnesium. About 30 different chemical ingredients constitute their make up. The beautiful residences, broad, well-kept streets and grounds, the long lines of shade trees, the parks, the drives, all make the place most attractive. Gratiot avenue is virtually a continuation of the avenue of the same name in Detroit. Both avenues are parts of what was once the government road made in 1840 and extending from the fort in Detroit to the fort at Port Huron. The churches and schools compare favorably with others in the State. Mount Clemens has considerable manufacturing and commercial interests. Some of the manufacturing establishments of the city are a carriage and wagon factory, agricultural implement works, beet-sugar factory, machine-shops, a large pottery, an automobile spring factory, a bath tub factory and a cooperage works. The government of the city is administered under the law of the State for the cities of the fourth class. The water-supply system is the property of, and is operated by the municipality. Pop. (1920) 9,488.

MOUNT COOK, or **AORANGI,** New Zealand. See Cook, Mount.

MOUNT DESERT, dĕ-zẹrt′ or dĕz-ėrt, an island off the coast of Maine, the largest belonging to the State, part of Hancock County. It is separated from the mainland by Western Bay, Mount Desert Narrows and Frenchman's Bay. It is about 15 miles long and 12 miles wide; area, about 100 square miles. The coast-line is very irregular; the chief indentations are on the north, Eastern Bay; on the south, Somes Sound, a fiord which extends into the centre of the island, and Southwest Harbor. On the west are Seal Cove and Western Bay. Bartlett's Narrows on the west separates Bartlett and Mount Desert Islands. On the south Cranberry Passage separates Great Cranberry Island from Mount Desert. The irregularity and nature of the coast-line, and the separation of the island from the mainland is due to submergence of the land and weathering. The surface is mountainous, along the northern coast is a line of rugged cliffs, and Green Mount, in the interior, is over 1,000 feet in height. Several fresh-water lakes beautify the island and add to its attractiveness. Long Pond, Eagle Lake, Jordan's Pond, Echo Lake and Seal Cove Pond are the principal bodies of water lying wholly within the interior.

The principal harbors are Bar Harbor, Southwest and Northeast harbors. Bar Harbor in Eden township is a popular summer resort and connected by a ferry to the Maine Central Railroad and by steamboat lines with Rockland, Portland, Boston and other Atlantic ports. There is a naval coaling station on the north shore of Eastern Bay. In Frenchman's Bay are five rocky islands called the Porcupines, and about 20 miles south, in the open ocean, is Mount Desert rock, on which is built a lighthouse.

The first authentic account of this island was given by Champlain (q.v.), who gave it the present name. In 1608 M. De la Saussaye and the Jesuit Fathers Lallemant, Masse, Quentin and Biard, together with 25 colonists from France, established on Somes Sound a colony which they called Saint Sauveur. Eight years later the colony was destroyed by a party of Englishmen from Virginia. The first permanent settlement was made by Abraham Somes, who, in 1761, built a house at the head of the sound which still bears his name. The town of Mount Desert was incorporated in 1789; Eden, in 1796; Cranberry Isles, in 1830, and Tremont, in 1848. The population of the several towns is about as follows: Mount Desert, 1,569;

Eden, 4,441; Cranberry Isles, 399; Tremont, 1,116. Consult Fairfax, 'At Mount Desert'; Street, 'Mount Desert, a History' (Boston 1905).

MOUNT ETNA. See ETNA, or ÆTNA.

MOUNT EVEREST. See EVEREST, MOUNT.

MOUNT FOREST, Canada, a town in Wellington County, Ontario, on the south branch of the Saugeen River, on the Canadian Pacific and Grand Trunk railways, 40 miles northwest of Guelph. Its industrial establishments include flour, grist, saw and woolen mills, and it has manufactures of iron, agricultural implements, carriages, leather, pottery and bricks. Pop. 1,839.

MOUNT GILEAD, Ohio, village, county-seat of Morrow County, on the Whetstone River, and on the Cleveland, Cincinnati, Chicago and Saint Louis and the Toledo and Ohio Central railroads, about 40 miles north by east of Columbus. It has considerable trade in farm and dairy products, and it is a distributing centre for quite a section of the country. The industries comprise hydraulic machinery works and a concrete sewer-pipe plant. The three local banks have combined resources amounting to $1,310,000. The value of taxable property is $2,500,000. The chief buildings are the opera house, fire house, mayor's office and the high and grammar schools. The government's receipts and expenses amount to $20,000. There are an electric-lighting plant, water-supply system, sewer system and disposal plant. Pop. (1920) 1,837.

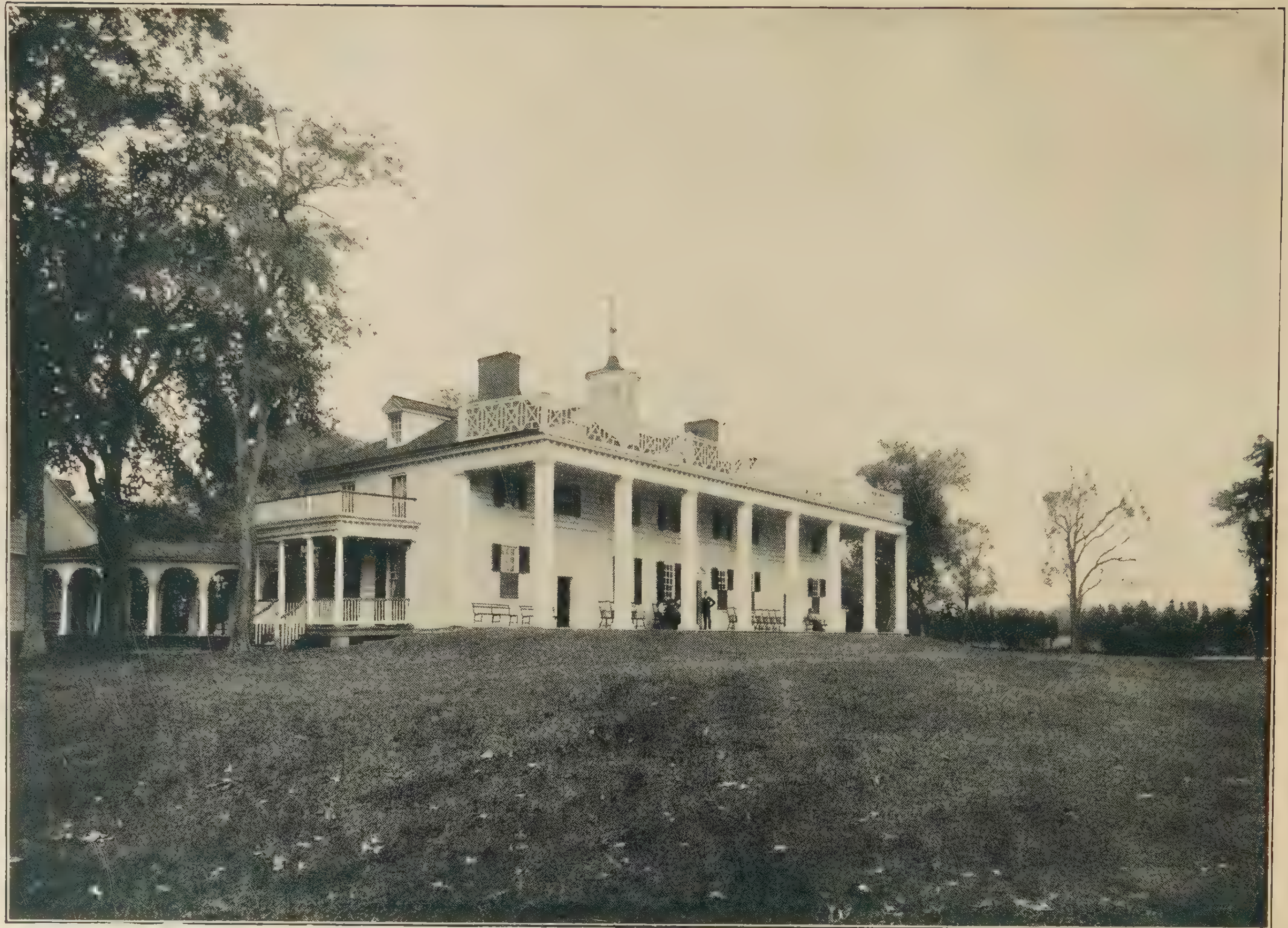
MOUNT HOLLY, N. J., town, county-seat of Burlington County, on Rancocas Creek, and on the Pennsylvania Railroad, seven miles south of Burlington City and 18 miles east of Philadelphia. It is in an agricultural section but its industries are chiefly manufacturing. The industrial establishments are foundries, large shoe factories, shirt-waist factories, a hammock factory, machine-shops, hosiery and tapestry mills, leathergoods works and canneries. There are two banks and two trust companies. The value of the town's taxable property is $2,300,000. The government's receipts and expenses amount to $26,000 approximately, annually balancing the account, excepting bond issues. The town has improved and well-lighted streets and sidewalks. It has the Children's Home, the Burlington County Hospital and the Burlington County Lyceum of History and Natural Science, founded in 1876. The library connected with the lyceum contains about 7,000 volumes. Some of the other prominent buildings are the churches, schools and county buildings. Pop. 5,900.

MOUNT HOLYOKE (hōl'yōk) **COLLEGE,** a college for women at South Hadley, Mass. It was founded by Mary Lyon (q.v.); chartered in 1836 and opened in 1837 under the name of Mount Holyoke Female Seminary. From the first it has had a reputation for thorough scholarship; the curriculum was gradually enlarged and the entrance requirements raised until a full college course was given and the old seminary course entirely superseded. In 1888 the name was changed to Mount Holyoke Seminary and College, and in 1893 to Mount Holyoke College. Formerly three degrees were given, A.B., B.S. and B.L.; but A.B. is now the only degree conferred. The course is arranged in two years of required and two years of elective work; the curriculum in addition to other subjects may include courses in education, biblical history and literature, music and art; a limited amount of technical work in the two latter courses may count toward the degree. Provision is also made for graduate work leading to the degree of A.M., and for special work for teachers. Graduates are entitled to fellowships in the American School of Classical Studies at Athens, and in the similar school at Rome; also to the advantages of the Zoological Station at Naples and the Marine Biological Station at Wood's Hole, Mass. Entrance to the college is by examination, or by certificate from approved schools. The campus now includes over 150 acres; the principal buildings are Mary Lyon Hall, which occupies the site of the original building destroyed by fire in 1896, the Dwight Memorial Art building, Lydia Shattuck Hall for the physics and chemistry departments, the Lyman Winston Hall for the other sciences, the Skinner Recitation Hall, the observatory, the gymnasium, the Student-Alumnae Hall which contains a large auditorium and offices for the college organizations and publications and for the alumnae secretary, seven large and four small residence halls, and the library which contained in 1915, 58,200 volumes; there are also plant houses and botanical gardens. Full attention is given to physical training; regular gymnasium work is required for the first three years of the course, and there is provision for basket ball and tennis. In 1915 the productive funds of the college amounted to $1,390,219.15, the income for the year was $372,939.39; the students numbered 791, the faculty 93 with a staff of 27 assistants, and the total number of graduates, 4,870.

MOUNT OF OLIVES. See OLIVES, MOUNT OF.

MOUNT PLEASANT, Iowa, city, county-seat of Henry County, on the Chicago, Burlington and Quincy Railroad, about 120 miles east by south of Des Moines and about 28 miles west of the Mississippi River. It is in an agricultural region in which considerable attention is given to raising horses and livestock. Large limestone quarries are in the vicinity. It was settled in 1834 by Pressley Saunders; incorporated in 1838, and chartered in 1851. The chief industrial establishments are flour and lumber mills, planing mills, brick and tile yards, potteries, wagon and carriage factories, grain elevators, repair shops and machine shops. It has considerable trade in grain, limestone, horses and livestock. It is the seat of the Iowa Wesleyan University (M.E.), founded in 1844, and until 1911 of the German Theological College (M.E.), founded in 1873. It has 13 churches, a conservatory of music, a high school, public and parish schools, and a Carnegie free public library. The State Hospital for the Insane is located here. The government is vested in a mayor and council of eight members, all of whom hold office two years. The city owns and operates the electric-light plant and the waterworks. Pop. 4,078.

MOUNT PLEASANT, Mich., city, county-seat of Isabella County, on the Chippewa



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MOUNT VERNON

River, and on the Pere Marquette and the Ann Arbor railroads, about 70 miles north by west of Lansing. It is in an agricultural and lumbering region, but the city has considerable manufacturing. The principal industrial establishments are brick and tile works, condensed milk factory, chemical works, lumber and flour mills, foundry, machine shops, woolen goods factory and furniture works. A Government Indian School and the Central State Normal School are in this city. Pop. (1920) 4,819.

MOUNT RAINIER NATIONAL PARK. See RAINIER, MOUNT.

MOUNT SAINT ELIAS. See SAINT ELIAS, MOUNT.

MOUNT SAINT MARY'S COLLEGE, a Roman Catholic school, founded Emmitsburg, Md., in 1808. It was chartered by the legislature of Maryland, and the charter was amplified in 1916, to enable the college to carry on its work more efficiently. There are 360 students in the scientific and classical courses. The faculty consists of 37 professors and instructors. The institution is under the direction of the secular clergy, who also have charge of a theological seminary, in which 75 seminarists, belonging to various dioceses, are prepared for the priesthood. The library has 30,000 volumes. The property is valued at $400,000, approximately.

MOUNT-STEPHEN, George Stephen, BARON, Canadian financier: b. Dufftown, Banffshire, Scotland, 5 June 1829; d. England, 29 Nov. 1921. He removed to Canada in 1850 where he engaged in mercantile business. He was afterward president of the Bank of Montreal and was conspicuous in promoting the completion of the Canadian Pacific Railway for which service he was knighted by the queen in 1886. He returned in 1888 to Great Britain and in 1891 was created Baron Mount-Stephen after a mountain in Canada which had been named after him. In 1887 he gave $500,000 for the founding of the Royal Victoria Hospital of Montreal; Sir Donald Smith (later Lord Strathcona) contributing an equal sum.

MOUNT STERLING, Ill., town, county-seat of Brown County, on the Wabash Railroad, about 70 miles west by north from Springfield. A fertile agricultural region surrounds the town, and coal and clay deposits are in the vicinity. The chief manufactures are tile, brick, flour, wagons and dairy products. The town owns and operates the waterworks. Pop. 1,986.

MOUNT STERLING, Ky., city, county-seat of Montgomery County, on the Chesapeake and Ohio Railroad, about 31 miles east of Lexington. It is in an agricultural region, and has considerable manufacturing. Its chief industrial establishments are flour and planing mills, a distillery, machine shops, a glove factory and furniture works. It has several private schools, good public schools and a public library. Pop. 3,932.

MOUNT UNION COLLEGE, in Alliance, Ohio, coeducational, founded in 1846 under the auspices of the Methodist Episcopal Church as Mount Union Seminary, and chartered as Mount Union College in 1858. It was the first consistently coeducational college in the United States. In 1911 Scio College, of Scio, Ohio, was amalgamated with it. Its courses lead to the degrees of A.B., B.S., Ph.B. and B.L. In 1923 there were connected with the school 31 professors and instructors and 430 students. Summer courses are provided for the long vacation.

MOUNT VERNON, the estate of George Washington, in Fairfax County, Va., on the right bank of the Potomac, 15 miles below Washington, D. C. The original name of the estate was Hunting Creek, and it contained about 800 acres. When it came into possession of Lawrence Washington, the brother of George, he changed the name to Mount Vernon, in honor of Admiral Vernon of the British navy. The house is of wood, erected on a bluff 200 feet above the river. It is a two-story house, 96 feet long and 30 feet deep. The main part was built by Lawrence Washington in 1743 and the wings were added by George Washington; the estate came into possession of George Washington in 1752 after the death of his brother. In 1859 the house and 200 acres of land around it was bought by the Mount Vernon Ladies' Association; the purchase money was $200,000, raised in great part by Edward Everett. Since then the Association has restored the house as nearly as possible to what it was in the lifetime of George Washington. A high piazza extends along the front of the house, and the six rooms on the ground floor contain many objects of historical interest connected with the life and times of Washington. The key of the French Bastille, the furniture used by the family, in the piazza the tiles which were brought from the Isle of Wight, and many other relics are objects of attraction to visitors. In the garden are a number of trees planted by Washington, and in the coach-house is his carriage. The room at the south end of the first floor is the one in which Washington died. In 1831 the body of Washington was removed from the old family vault to a tomb, a plain brick structure, which is near a wooded ravine, a short distance from the house. Behind an iron grating may be seen the two sarcophagi which contain the remains of George Washington and his wife, Martha.

The estate was willed by George Washington to Bushrod Washington, and at the death of the latter it came into possession of John A. Washington, from whom the Ladies' Association purchased the house and adjacent grounds. Consult Lossing, 'The Home of Washington' (New York 1865); Page, T. N., 'Mount Vernon and its Preservation' (New York 1910); Wilstsch, P., 'Mount Vernon, Washington's Home and the Nation's Shrine' (New York 1916); Wineberger, 'Home of Washington at Mount Vernon' (Washington 1866).

MOUNT VERNON, Ill., city, county-seat of Jefferson County, on the Southern, Wabash, Chester and Western, Chicago and Eastern Illinois, and the Louisville and Nashville railways, about 115 miles south by east from Springfield, 76 miles east of Saint Louis. The site for a city was first marked in 1819, and city lots laid out in 1840, and incorporated as a city in 1872. It lies in the north edge of the great Southern Illinois coal field, having one mine and is surrounded by splendid agricultural country, producing corn, oats, wheat, hay, fruit and vegetables. It has a plant for producing 22 wooden and 18 steel freight cars per day, its chief manufacturing, constantly operating to near full capacity. Its other manufactures are cut-glass, cotton hosiery, ice-cream, railroad cross-ties, preserving, concrete, brick, flour, bread and pastry, mattresses. Dairying is fast becoming the chief industry on the farm. Its chief public buildings are the county courthouse, State appellate courthouse, Federal post office, six grammar schools employing 52 teachers and a high school employing nine teachers. The city spends on school maintenance annually $48,000. There are 12 principal churches, some of them very excellent edifices. The government is under a charter under the general statute of the State, with mayor and 12 councilmen who hold office for two years. Pop. (1920) 9,815.

MOUNT VERNON, Ind., city and county-seat of Posey County, on the Ohio River near the mouth of the Wabash, and on the Chicago and Eastern Illinois and the Louisville and Nashville railroads. It is in a rich agricultural region in which principal crops are corn, wheat and hay. Coal is plentiful in the near vicinity and the city is underlaid with two good veins of bituminous coal. It lies on a large flat top bluff of over four miles frontage, one of the very few places on the Ohio River never endangered by high waters. The principal industries are flour mills, hominy mill, straw board plant, foundry and machine shop and products, lumber and lumber products. It has seven churches, five public schools, including an accredited high school, and one parochial school, a modern courthouse and a Carnegie-Alexandrian free public library. The three banks have a combined capital of $200,000 and a surplus of $100,000, do an annual business of $10,000,000 and annual clearings are $1,000,000. The government is vested in a mayor and a council of six members, each of whom holds office four years. Pop. 5,284.

MOUNT VERNON, N. Y., city in Westchester County, on the Bronx River and Hutchinson River, an arm of Pelham Bay, and on the New York, New Haven and Hartford, and the New York Central and Hudson River and New York, Westchester and Boston railroads, adjoining New York city on the north, and about 13 miles from the Grand Central station in New York. Electric lines connect Mount Vernon with New Rochelle, Yonkers and a number of the villages and cities in the vicinity. Rapid transit lines from New York city extend almost to Mount Vernon (1903) and the present plans provide for the extension of the lines into the heart of the city. Mount Vernon is really a residential suburb of New York; a large part of the city is restricted for residential purposes. It was founded in 1852 and in 1892 was chartered. It has several industrial establishments and considerable trade, chiefly in the products of market-gardens and as a distributing centre for the nearby sections of county. The Westchester Lighting Company is located here. It has about 1,000 employees, and furnishes for many places in Westchester County, light, power and heat for public and private uses. The streets and avenues are well-paved and well-kept. The handsome lawns and gardens and the great number of shade trees make the city most attractive. Some of the prominent buildings are the Mount Vernon Hospital, the Lucas Building, Proctor's Theatre, new high school, new police building, new post office, fine church and school buildings. It has a public library founded in 1896, and the building donated by Andrew Carnegie, at a cost of $50,000, was begun in 1903. The water, electric-light and sewer systems are all well organized and are being improved and extended to meet the needs of a growing city. The government is administered under the original charter, which provides for a mayor who holds office two years and a council. The mayor appoints, subject to approval by the council, all the administrative officers except the board of education, comptroller, assessors and receiver of taxes, who are elected by the people. Pop. (1920) 42,726.

MOUNT VERNON, Ohio, city, county-seat of Knox County, on the Kokosing River, and on the Cleveland, Akron and Cincinnati and the Baltimore and Ohio railroads, about 40 miles northeast of Columbus and 85 miles southwest of Cleveland. It is in an agricultural region and near the natural gas belt. The chief industrial establishments are a foundry, the Corliss engine-works, flour and lumber mills, bottle works, large glass plants, Pennsylvania Railroad repair shops and bridge works. It has considerable trade in manufactured articles and in farm and dairy products. The Hiawatha Park, the courthouse, the library and fine church and school buildings, all contribute to the attractive features of the place. The city owns and operates the waterworks. Pop. (1920) 9,237.

MOUNT WASHINGTON. See WASHINGTON, MOUNT.

MOUNTAIN ASH, Wales, a coal and iron-mining town of Glamorganshire, five miles south of Merthyr-Tydfil. The principal buildings comprise the parish church of Saint Margaret, the Workman's Hall, a library and reading-room, etc. Pop. 42,246.

MOUNTAIN ASH, QUICKEN TREE, or **ROWAN TREE,** popular names for a small European tree (*Sorbus aucuparia*) of the order *Rosaceæ,* and, by extension, for two American species. The European species is an erect, graceful tree about 30 feet tall; bears ash-like, odd-pinnate leaves; corymbs of small yellowish-white flowers followed by globular orange colored acid fruits (pomes). It is frequently planted for ornament and seems to thrive upon any soil except that which is very heavy or very light, or poorly drained. It does well in the cold north beyond the range of most fruit trees, and there the fruits are often made into preserves. The hard, compact wood is used for turning, cabinet work, etc. In Europe its twigs are highly prized by the superstitious as charms and as guardians against evil sprites.

The American species (*S. americana*), which resembles the preceding, ranges from Labrador to the mountains of North Carolina and from there irregularly northwestward to Manitoba. With the exception of its wood, which is light and inferior, it is used like the first species. The elder-leaved species (*S. scopulina*) ranges from Pennsylvania and Michigan to Labrador and an allied species extends in eastern Asia as far south as Japan. Its flowers and fruits are larger than those of the previous species and its leaves are more like those of the elder. In the southern part of its range it is only occasional; in the northern, common. Both American species are frequently reduced to shrubs.

MOUNTAIN BEAVER. See SEWELLEL.

MOUNTAIN BLACKSNAKE, MOCKING BIRD; PLOVER, SHEEP, etc. See BLACKSNAKE; MOCKING-BIRD; PLOVER; SHEEP, etc.

MOUNTAIN CLIMBING, formerly regarded as exploration or adventure, now recognized as one of the hardier outdoor sports. At first regarded as extremely perilous, mountain climbing or mountaineering now claims hundreds of thousands among its devotees. The effort, endurance and skill required by the sport are in themselves physical virtues which carry their own rewards. Far beyond this is the profound mental invigoration from association with nature in her most majestic phases and awe-inspiring moods. Mountain climbing may be properly viewed as of two distinct classes, according to the goal to be attained — the low mountains, or the high mountains. The ascent of the lower mountains like the White Mountains, the Adirondacks, or the Carolina mountains is a very common amusement for summer visitors in such regions, and demands no special adaptability. The slight rarefaction of the air at the elevation to which these summits reach do not seriously affect the untrained climber. But for elevations higher than 10,000 feet above the sea-level a special type of physical development is required, and as a rule a long and persistent cultivation becomes necessary. There are a few individuals who are naturally fit, possessing the requisite qualifications without preliminary training. They are of the class who have at sea-level a pulse beat below the normal — about 60 beats to the minute. This slow pulse will have risen to not more than 70 or 75 beats per minute at 10,000 feet elevation, while a normal pulse beat of 70 at sea-level will rise to 90 or 95 at 10,000 feet, with the consequent distress, requiring frequent and prolonged rests. But aside from this peculiar physical disposition other qualifications are needed to make a successful and exultant mountaineer — a delicate sense of balance, coolheadedness, fearlessness, imperturbability, besides superabundant muscular strength. The course of training to which an ambitious member of the British Alpine Club submits himself begins with rock and crag climbing among his home mountains; and then follow progressively the Swiss mountains, the Caucasus, the Southern Alps of New Zealand, the Siberian Atlas or the mountains of Chinese Turkestan, and last, the Himalayas. It is a fact, however, that several of the high Himalayas do not demand as much real climbing as mountains much lower, for in not a few cases mules may be taken in the Himalayas to heights of 18,000 to 20,000 feet, leaving comparatively little toil to the mountaineer. On the more rugged mountains the ascent of 3,000 feet elevation is regarded as a full day's work.

While there are several rumored ascents of mountains which have gained through repetition a certain historical position, it is generally accepted that the pioneer of mountaineering as it is understood to-day was Jacques Balmat, who, with Michel Paccard, at the instigation of the scientist de Saussure, made the ascent of Mont Blanc in 1786. The following season Balmat piloted Professor de Saussure and a party safely to the same summit. Ascents of other Alpine peaks were soon recorded, but they were almost exclusively by explorers for scientific information. Amateurs began to become interested in the sport soon after 1850, and a party of English tourists succeeded in ascending Mont Blanc without a native guide in 1856. But the systematic and scientific climbing of mountains had its growth from the formation in 1857 of the first Alpine Club in London, which was organized to enlarge «the community of feeling among those who in the life of the High Alps have shared the same enjoyments, the same labors and the same dangers.»

Alpine Clubs.—Alpine clubs and mountain-climbing societies have since been organized in nearly all continental countries. The European clubs and societies have an aggregate membership of over 120,000; the consolidated German and Austrian clubs having 75,000; Italian, 14,000; French, 6,000; and Swiss, 12,000.

Climbing Records.— The records of mountain climbers cover all nationalities and various years from Balmat (1787) to Dr. Stuck (1912). The highest point thus far climbed in foreign lands was 24,583 feet by the Duc d'Abruzzi in 1909 in his climb of Mount Bride in the Himalayas. He did not reach the summit, some 600 feet higher. Previous to this feat the record had been held by W. W. Graham, who in 1883 reached a height of 24,015 feet. In North America, the Duke of Abruzzi and his party reached a height of 18,024 feet on Mount Saint Elias in 1897. In South America, S. Vines climbed 22,860 feet to the summit of Aconcagua in the Andes in the same year. In 1903 Mrs. Workman accompanied her husband, Dr. W. H. Workman, to the summit of Lungma in the Himalayas, a height of 22,868 feet. In the United States the more recent notable ascents have been that of the South Peak of Mount McKinley on 7 June 1912 by Dr. Hudson Stuck and H. P. Karstens — a height of 20,300 feet; and that of Mount Blackburn (16,140 feet) by Miss Dora Keen on 19 May 1912.

The Bureau of Associated Mountaineering Clubs of North America was organized in May 1916 by nine clubs and societies. Seven more clubs joined the association during the year, and in 1917 the combined membership was about 12,000. The societies included in the association were:

The American Alpine Club, of Philadelphia and New York; the American Civic Association, of Washington, D. C.; Appalachian Mountain Club, of Boston and New York; British Columbia Mountaineering Club, of Vancouver; Colorado Mountain Club, of Denver; Explorers' Club, of New York; Fresh Air Club, of New York; Geographic Society, of Chicago; Geographical Society, of Philadelphia; Green Mountain Club, Inc., of Rutland, Vt.; Hawaiian Trail and Mountain Club, of Honolulu; The Mazamas, of Portland, Ore.; The Mountaineers, of Seattle; Prairie Club, of Chicago; Sierra Club, of San Francisco and Los Angeles; and the United States National Parks Service Club, of Washington, D. C. The Alpine Club, of Canada, while not a member, is affiliated with the association.

The object of the association is declared to be to unify effort in the preservation of natural scenery, including also bird and animal life, trees and flowers; the creation and development of national parks and reservations; and the opening of mountainous regions with trails and shelters.

Accidents.— In the Alpine countries, thousands of Swiss, Italians and Tyrolese have become professional guides, and their skill exceeds that of the most scientific of learned Alpine club members. Hundreds of lives among both visitors and guides have been lost in the Alps, but this fact does not appear to deter thousands of others from making ascents each year. Accidents in mountain climbing rarely occur when guides are employed and reasonable precautions are taken. Occasionally a foothold seemingly secure gives way; but more frequently the fall occurs because the climber is overtired, or has started too quickly, without the necessary training. Over-exertion of either body or mind is always to be avoided. The use of the alpenstock and the ice-axe in mountain climbing, as well as general directions for making an ascent and descent, are fully set forth in a manual prepared under the auspices of the London Alpine Club, entitled 'Dent's Mountaineering.'

The bibliography of mountain climbing is very voluminous, and is eagerly sought after by a large number of persons debarred by physical inability from engaging in the rigorous exercise, but who are none the less ardent mountaineers at heart. The following named volumes are only the more prominent of those published in recent years. The extensive library of the American Alpine Club was recently placed in the custody of the New York Public Library, which compiled and printed a complete list of the books and pamphlets, to be had upon application.

Bibliography.—Abraham, G. D., 'Complete Mountaineer' (London 1907); 'On Alpine Heights and British Crags' (Boston 1916), and 'Swiss Mountain Climbs' (London 1912); American Alpine Club, 'Alpina Americana' (Philadelphia 1907–14); Appalachian Mountain Club, 'Guide to Paths in the White Mountains and Adjacent Region' (Boston 1916); Bell, J. M., 'The Wilds of Maoriland' (London 1914); Belloc, H., 'The Pyrenees' (London 1909); Bent, A. H., 'Equipment for Mountain Climbing' (Boston 1916); Bowman, I., 'The Andes of Southern Peru' (New York 1916); Browne, B., 'The Conquest of Mount McKinley' (New York 1913); Burlingham, F., 'How to Become an Alpinist' (London 1914); Burpee, L. J., 'Among the Canadian Alps' (New York 1914); Coleman, A. P., 'The Canadian Rockies: New and Old Trails' (Toronto 1913); Conway, Sir W. M., 'The Alps from End to End' (London 1905); Cook, F. A., 'To the Top of the Continent' (New York 1908); Du Faur, F., 'The Conquest of Mount Cook' (London 1915); Farrer, R., and Compton, E. H., 'The Dolomites' (London 1913); Filippi, F. de, 'Karakoram and the West Himalayas' (London 1912) and 'Ruwenzori' (London 1909); Freshfield, D. W., 'Exploration of the Caucasus' (2 vols., London 1902); and 'Round Kangchenjunga' (London 1903); Gribble, F., 'The Early Mountaineers' (London 1899); Hamer, S. H., 'The Dolomites' (London 1910); Holtz, M. E., and Bemis, K. I., 'Glacier National Park: Its Trails and Its Treasures' (New York 1917); Kilbourne, F. W., 'Chronicles of the White Mountains' (Boston 1916); King, C., 'Mountaineering in the Sierra Nevada' (New York 1907); Lewis, T. H., and Munson, S. C., 'The Upper Engadine' (London 1907); Mills, E. A., 'The Rocky Mountain Wonderland' (Boston 1915), and 'Your National Parks' (Boston 1917); Morley, M. W., 'The Carolina Mountains' (Boston 1913); Muir, John, 'Our National Parks' (Boston 1909), and 'The Mountains of California' (New York 1911); Mumm, A. L., 'Five Months in the Himalayas' (London 1909); Neve, E. F., 'Beyond the Pir Panjal' (London 1912); Peck, A. S., 'A Search for the Apex of America' (New York 1911); Ross, M., 'A Climber in New Zealand' (London 1914); Turner, S., 'My Climbing Adventures in Four Continents' (London 1911); Workman, F. B., and W. H., 'Peaks and Glaciers of Nun Kun' (London 1909), 'The Call of the Snowy Hispar' (New York 1911), and 'Two Summers in the Ice Wilds of Eastern Karakoram' (London 1917).

MOUNTAIN EBONY. See BAUHINIA.

MOUNTAIN-FEVER, or MOUNTAIN-SICKNESS. The term mountain-fever was applied formerly to a fever accompanied by debility, diarrhea, etc., which occurred quite frequently (and now occurs occasionally) in the mountains, especially those in the western part of the United States. It is now generally conceded that this form of fever is essentially typhoid, modified by the effects of extreme altitude. The term mountain-sickness (sometimes used synonymously with mountain-fever) means a condition produced by the action of rarefied air upon organic functions, especially in persons who exercise considerably. The fact that the same symptoms are caused in persons who climb mountains to the height of several thousand feet and in those who ascend in balloons to twice as great a height is accounted for by the exhaustion caused by the climbing. The intake of oxygen is diminished in high altitudes; the pulse is quickened, and the body-temperature raised to 100°–101° F. Difficulty in breathing, headache, vertigo, nausea and vomiting are likely to occur. Hemoptysis is rare, although it is found in tuberculous patients who have sought health in the mountains. Rest and acclimatization are the remedies and oxygen has been given to offset the diminution of it in the air. It is also administered through the stomach in the shape of chlorate of potash, the aim being to keep up the normal constitution of the blood which at high altitudes is not so readily freed from carbon dioxide on account of the inadequacy of the lungs to exhale it.

MOUNTAIN GOAT. See ROCKY MOUNTAIN GOAT.

MOUNTAIN LAUREL, or AMERICAN LAUREL, a shrub of the genus *Kalmia* of the order *Ericaceæ.* The few species which are natives of North America and Cuba are mostly shrubby, evergreen and highly ornamental, especially when in flower, the blossoms being usually in terminals corymbs or axillary umbels, individually of medium size, white, pink or purple. On account of their beauty and hardiness most of the species are very popular for planting in parks and private grounds even in the northern States and southern Canada. They do well in ordinary garden soil if not too clayey, but thrive best in peaty or sandy soil, particularly in partial shade. They require plenty of moisture and will do well even in marshy soil. The best known species is probably *K. latifolia,* most frequently known by the above names and also as calico-bush and rhododendron. It ranges from New Brunswick to Ohio and southward to Florida. Sheep-laurel (*K. angustifolia*), also known as wicky and lambkill, extends from Labrador southward to Georgia. These two species are the most conspicuous flowers in the Alleghany Mountains during the early summer. *K. polifolia,* also found in the East, is common in the Rocky Mountain region from Alaska to California. The deciduous species *K. hirsuta* and *cuneata* range southward from North Carolina. They are less planted in the north than the first two species.

MOUNTAIN LIMESTONE, a term commonly used in England of the stratum in southern England and Wales at the base of the carboniferous deposits. The phrase was also used for a time of the subcarboniferous limestones of American plains, but has now been dropped. It contains many fossils, especially crinoids and some important fossil fish. Its commercial value, apart from its being a bearer of lead and zinc ores, lies in its use as building stone, since it is capable of a high polish, and for the preparation of lime.

MOUNTAIN LION. See Cougar.

MOUNTAIN MAHOGANY, the sweet or black birch. See Birch.

MOUNTAIN MEADOWS MASSACRE, in American history, a massacre of Western emigrants, near Mountain Meadows, Utah, in September 1857. The emigrants numbering 140 souls were on the way from Arkansas and Missouri to Southern California. While in camp in the valley of Mountain Meadows, in Washington County, they were attacked by Indians and it is alleged by Mormons disguised as Indians. They held their ground for three days, when under promise of protection by John D. Lee, a Mormon and Indian agent, they left their barricade of wagons; whereupon the attack was renewed and every person of the 140 slaughtered excepting 17 young children. These were distributed among Mormon families but were afterward restored to their relatives by the United States government. The Mormons have always been blamed for the massacre. Lee was executed for the urder in 1877, but a number of his codefendants were acquitted. Lee in his confession asserted that the massacre was ordered by Brigham Young and other Mormons high in authority, but the facts are not certain. Consult ‘Confessions of John D. Lee’ (Saint Louis 1891); Bancroft, H. H., ‘History of Utah’ (San Francisco 1889); Linn, ‘Story of the Mormons’ (New York 1902).

MOUNTAIN TEA. See Gaultheria.

MOUNTAINS. A high elevation of land is called a mountain; a low elevation, a hill. The application of the term «mountain» varies in different localities. In the low lands, where the elevations are not numerous, and do not reach a great height, a rise of ground of about 100 or 200 feet is called a mountain; while in a mountainous country an elevation of 1,000 feet, or less than 2,000 feet, is often called a hill. Prominent parts of mountains or isolated mountains are called *peaks.* Some of the common names applied to the parts of a peak, or mountain, are summit, base, slope, crest, pinnacle, needle, knob. A series of connected mountains form a *ridge, range* or *chain;* if the mountains extend a considerable length, the whole is called a range or chain; if short, a ridge. A group of parallel ridges or ranges, or of ridges or ranges near together, usually resultants from similar causes, is called a mountain *system;* and several systems combined form a *cordillera.* An elevation with a level-topped area of considerable extent is called a plateau and is usually associated with mountains. Many of the highest mountains of the world rise thousands of feet above the basal platform of the plateau. The *mesa* is a large level-topped section of the plateau; the *butte* is a small section. Valleys, lower land than plateaus, exist between the ridges, ranges or systems. A wide valley is often an *interior basin.* The interior basin area of Australia is over 51 per cent of the whole area; of Africa, 31 per cent; of North America, 32 per cent and of Eurasia, 28 per cent. (See Great Basin; Valleys). Low, narrow places in mountain ridges and chains are called *passes.* The depressions among the mountains contribute in a great measure to a solution of the causes which have determined the kind and location of the vast elevated land masses of the earth.

Mountains have been variously classified, but the following outline embraces most of the important classes which have been described.

1. **Folded Mountains.**— These make up the great mountain systems of the world, and usually consist of very thick sedimentary rocks which by lateral compression have been thrown into more or less closely compressed series of folds or flexures. When first folded, the up arches or anticlines constitute mountains, the troughs or synclines form valleys. Such a situation is found in the Jura Mountains, in Switzerland. In other cases the folds may have been completely worn away to a plain and uplifted. Erosion has then etched out the softer rocks, leaving the edges of the harder rock layers projecting. In such cases the ridges may be the syncline, the flanks of the fold, or the anticline, wherever the hard layer of rock may happen to be. This latter is the history of the Appalachian Mountains. Mountains are frequently regions of intense igneous activity, and the cores of ranges are often occupied by enormous bodies of granitic rock which have melted their way into the sediments, as in the case of the large batholith core of the Sierra Nevada Mountains, in California. The cause of the compression which produces such folds is by no means clear. By some it is attributed to the fact that the supposed molten interior of the earth cools and contracts and that as a result the crust, in accommodating itself to the smaller nucleus is forced to crumple. Others believe that great wedge shaped blocks of the earth's crust settle toward the centre, and so crowd one another that crumpling is produced

at the borders of the blocks. Whatever may be the cause, the fact remains that some enormous force causes lateral thrust, throwing the rocks into great folds and producing thus all the great mountain systems of the world. See FOLDS.

2. **Fault Mountains.**— Sometimes great breaks occur in the earth's crust, one side of the fracture dropping hundreds of feet, and leaving the elevated block as a mountain. Many of the ranges of western Utah and Nevada are of this origin. See FAULTS.

3. **Volcanic Mountains.**— Mountain ranges are rarely formed by volcanic action alone, but isolated peaks are often of this origin. Volcanic cones, great piles of lava and ash, form one type, of which Mount Shasta is one of our best-known examples. Recently formed cones are often beautifully symmetrical, as are those of Hood and Shasta. But as soon as activity ceases, denudation sets in, the cone becomes gashed with valleys, and in course of time only the harder central plug is left as a volcanic neck. Such plugs are common in the Puy region of central France, and the Mount Taylor region of New Mexico. Sometimes masses of igneous rock are intruded under sedimentary beds in the form of laccoliths (q.v.), arching up the beds to form elevations such as the Henry Mountains in Utah. Many regions of folded mountains also have numerous volcanic peaks, as in the case of Mount Hood and other cones on the folded Cascade Range. See BATHOLITHS; CONE; LACCOLITH; VOLCANO.

4. **Residual Mountains.**— When great areas are uplifted bodily without folding, they form plateaus. When such a plateau is greatly dissected, it becomes mountainous in topography, merely because some parts are not worn away as fast as others. These are residual mountains, or mountains of circumdenudation. The Allegheny plateau is a region of this type.

Whatever may be the cause which makes the uplift on the earth's surface, denudation begins as soon as the peak appears, and formation and destruction are conjoint agents in making the mountains what they are on the surface of the earth. Before the process of folding is completed the elements have begun their work of shaping and sculpturing, but the destructive agents at first work more slowly than the constructive. The chief agents of changes after formation are frost, wind and water. The position of a mountain gives some idea of its rock structure, and its rock structure and form tell something of its age. The presence of hard rock in a mountain is often shown by the upright peak whose faces may be comparatively bare, but which points up, resisting wind and water. Pike's Peak is granite rock. The White Mountains, N. H., have many hard rocky peaks; the Matterhorn, in the Alps, is a hard crystalline rock, and some of the Alaska peaks are examples of almost unyielding formations that appear to defy the ages. Remarkable examples of the sculpturing of the mountains by water are shown in the gorges in the Rocky Mountains, the removal of soft layers leaving the hard rocks standing like gigantic castellated ruins. The high, sharp pointed peaks and the irregular rugged surfaces indicate that the mountains are not among the oldest of the earth. The Adirondacks, with their low, rounded tops, their comparatively uniform slopes, show that long periods have passed since their formation; erosion and weathering have removed much of the ruggedness and sharp angularities that once existed. Along the Atlantic Coast east of the Appalachian Mountains the low round hills are remnants of what were once high mountains. If given sufficient time, erosion will reduce the highest mountains to low featureless plains.

The mountains of the world are distributed with remarkable uniformity. The longest and highest ranges of North and South America face the Pacific Ocean, and extend almost due north and south. The longest and highest ranges of Eurasia extend nearly east and west. Starting from the highest plateau in the world, Pamir, in Asia, there are extending west, mountain ranges which are continuous through Europe to the Atlantic, and, also, with but few low depressions, along the eastern coast of Africa to Cape of Good Hope. Passing east from the plateau of Pamir are lofty mountain ranges extending to the northeastern part of Asia, which crossing to Alaska, unite with the great ranges which skirt the western coast of the Americas. The highest mountains in the world are the Himalayas; the highest peak, Mount Everest, is fully 29,000 feet high.

High mountains exist on the bed of the ocean. A number belonging to the submerged Atlantic continent have been located, and their elevation determined. Some of the most prominent are Mount Chaucer, located in 1850, in lat. 42° 50′, long. 28° 50′, crest 284 feet from the surface; Mount Sainthill, in lat. 42° 50′, long. 42° 20′, discovered in 1832, height about 11,000 feet. Another important submarine mountain is the Laura Ethel, discovered in 1878, its crest about 216 feet below the surface. A group of submarine mountains, in lat. 43°, long. 22° 30′, has been named Edward the Seventh Range. Other Atlantic peaks are Tillotston, Bright, Placentia and some in lat. 45° and long. 48°. Mount Placentia is only about 30 feet below the surface.

The mountains of the world are the great depositaries for the world's mineral wealth. The large proportion of the valuable metals in general use in the world have been obtained from the mountains. This is probably due to the close relation between mountains and igneous activity. (See ORE DEPOSITS). Mountains affect the climate by protecting from cold winds or by preventing the ocean breezes from cooling the interior of countries in tropical regions, and by controlling in a great measure the rainfall. (See CONDENSATION). The flora and the fauna, so dependent upon climate, are modified greatly by the mountains. The elevations are the great water-reservoirs of the world; they store almost the whole supply of water which falls on the earth's solid surface and distribute it in channels throughout the land. Lakes and springs are common in mountains. These elevated land masses of the earth have been most important in determining the history of the world. They are natural boundaries, they have protected the weak from the strong, the civilized from the savage, and many sturdy, powerful races of to-day owe their early preservation in a great degree to the mighty natural barriers which stood between them and a stronger and more ferocious race. The mountains of the world have affected the literature and art of the world, and these influences are still felt wherever a mountain uplifts its crest.

Bibliography.— Reade, T. M., ‹The Origin of Mountain Ranges› (London 1886); Willis, B., Thirteenth Annual Report, United States Geological Survey, Washington, D. C. (1893); Russell, I. C., Fourth Annual Report, United States Geological Survey (1884); Geike, ‹Mountain Architecture›; Geikie, J., ‹Mountains, their Origin Growth and Decay› (New York 1914)); ‹Earth Sculpture›; Reclus, ‹The History of a Mountain›; Elie de Beaumont, ‹Notice sur les Systèmes de Montagnes› (Paris 1852).

MOUNTAINS OF THE MOON. See Moon, Mountains of the.

MOUNTED POLICE. See Police.

MOURNING. In most nations from the earliest ages it has been the custom of bereaved persons to testify their grief for the loss of friends or relatives by some external change of dress and deportment. The eastern nations and the Greeks cut off their hair, the Romans allowed the beard and hair to grow, in mourning. Different colors have been adopted as badges of grief; the ancient Egyptians wore yellow; the Ethiopians, gray; the Roman and Spartan women, white, which is still the color of grief in China, Japan and Siam; in Turkey, blue and violet; and in the other European countries, black is used for this purpose. Some have attempted to trace the associations by which the colors acquired their character to natural causes; but it must be allowed, with little success. The Jews, in sign of grief at the loss of their relatives, rent their garments, tore out their hair and wore coarse garments of a dark color; they went barefoot, neglected their persons and performed other acts of penance. The term of mourning with them was from 7 to 30 days. Among the Greeks and Romans it was the custom to lay aside all ornaments of dress, to abstain from the bath and all indulgences. The kings of France mourned in violet. Among the ancients, as among the moderns, public mournings were common on the death of the sovereign or of a distinguished public benefactor. The period of mourning differs in different countries, but in all is generally regulated by the nearness of relationship between the survivors and the deceased. In Scotch law a widow has a claim to mournings for her husband where his estate or rank requires mourning in point of decency. Mournings for such of the deceased's children as are to be present at the funeral also form a privileged debt. In the United States the customary period of mourning for widows is one year.

MOURNING-CLOAK. A butterfly. See Camberwell Beauty.

MOURNING-DOVE. See Dove.

MOUSCRON, moos'krôn, Belgium, town in the province of West Flanders on the French border and located on the Ghent-Tournai and the Oudenarde-Mouscronn railways, 32 miles distant from Ghent. It has a customs station, episcopal college, cotton and woolen goods factories, a brewery, etc. In 1910 it had 22,122 inhabitants.

MOUSE, a small rodent mammal of the family *Muridæ*, the larger members of which are called rats, hamsters, lemmings, voles (qq.v.), etc.; specifically, the house-mouse (*Mus musculus*), originally Asiatic, but universally domesticated. The family is an extremely large one, embracing some 300 well-established species, and is distributed over the whole world except the islands of the Pacific. A mouse is the only native mammal of Australia besides the dingo (q.v.) not a marsupial. The members of this family vary in size from some smaller than a house-mouse to the bigness of the American muskrat (q.v.); and exhibit much diversity in form, especially in respect to the limbs, which in woodland and aquatic species are usually of nearly equal size, but in those that dwell on prairies and deserts are far from it, the hind-legs there becoming immensely enlarged and serving as almost the only means of safety (by leaps), while the fore-legs are of little use except as hands in holding the food. It is a characteristic of mice, as of squirrels, to lift the food to the mouth and gnaw it while the animal sits up on its haunches. The pollex (thumb) on the fore feet is a mere wart-like rudiment; but the hind feet have five full toes, and in some aquatic species these are connected by webs forming swimming feet. The skull is shapely, the nose is long, pointed, hairy, keenly sensitive to odors, and protected by remarkably long tactile hairs (whiskers); the eyes and ears are usually large, for these animals are mainly nocturnal in habits; and the teeth are peculiar in that the lower incisors are compressed and pointed, and the molars (usually three on each side) are rootless. The tail in nearly all rats and mice is long, always thinly haired, often naked or scaly, and in such aquatic species as the muskrat is compressed into a powerful sculling oar. Most species burrow or make their homes in holes; a few are arboreal. The nearest relatives of the group are the dormice, mole-rats, jerboas and pouched rats or gophers, a list which shows that the word «mouse» and «rat» is popularly applied to many small rodents outside the *Muridæ*. This family is divisible into 10 sections — *Murinæ*, or typical Old-World mice; *Hydromyinæ; Phyncomyinæ; Gerbillinæ; Otomyinæ; Dendromyinæ; Lophiomyinæ; Microtinæ*, or voles; *Sigmodontinæ*, or hamsters; and *Neotominæ*.

The first sub-family contains the various rats (q.v.), the house-mouse, the delicate harvest-mouse and more than 100 other species of Europe and Asia, which agree in having wide upper molars marked by three series of tubercles and in other distinctive peculiarities. The house-mouse has been a denizen of men's habitations probably ever since housekeeping began, finding there safety from many natural enemies, opportunities and materials for nest-making, and plentiful daily food. It accompanies mankind wherever he goes, and soon replaces in frontier houses the local wild mice which for a time attempt to imitate its domestic habits. These mice are about three inches long, the tail measuring one and one-half inches more. The general color is bluish or dusky brown, but is subject to variation and influenced by cilmate, food and other external conditions. Albino or «white» mice, with pink eyes, are kept as pets, also black and piebald ones; and these breeds are easily maintained by selective breeding. Such pets are readily tamed and taught simple tricks. Certain individuals, known as «singing mice,» make, especially at night, a pleasing whistling noise, like feeble chirpings of a canary-bird. The same sound has been heard from wild-mice, and is believed to result from an asthmatic condition rather than to be a normal musical utterance. The fecundity of mice is excessive. From six to ten young are produced in a litter, and this species brings forth several times in the year. In about a fortnight the young are able to shift for themselves, although born in a helpless condition. This illustrates how sometimes, under especially favorable conditions, mice may multiply far beyond normal numbers and overrun the country as a devastating plague, instances of which are mentioned under FIELD MOUSE. The two most common European types, the long-tailed brown field-mouse (*M. sylvaticus*) and the diminutive harvest-mouse (*M. minutus*) are farmers' pests, destroying large quantities of grain. The harvest-mouse is one of the smallest of mammals and constructs a beautiful and elegant little nest of the blades of grass or corn, entwined round and supported by the stalks of the corn or wheat. A similar smaller species in South Africa weighs only a quarter of an ounce. These out-door species hibernate during winter and lay up an autumnal store of grain in their nests and burrows — a matter in which great diversity of habit exists elsewhere in the family.

American native mice are all of one or the other of the remaining sub-families, or else do not belong to the *Muridæ* at all. The short-tailed meadow-mice (see FIELD-MOUSE), the neotomas (see WOOD-RAT), lemmings (q.v.), and their allies are elsewhere described. The most of our smaller mice belong to the subfamily *Sigmodontinæ,* characterized prominently by having cheek-pouches, and represented in the Old World by the hamsters. Five genera and about 75 so-called species have been catalogued, but probably further study will greatly reduce the number. *Onychomys* is a rather short-tailed, fossorial genus of the plains region and northern Mexico. *Sigmodon* is another genus of Florida and the Southwest, taking its name from the sigmoid form of the cusps of the molars; *Reithrodontomys* embraces several very small burrowing brown mice of the same region; and *Oryzomys* includes the large, handsome «rice-field mouse» of the Southern States (*O. palustris*). The fifth genus, *Peromyscus,* contains the most numerous and familiar of the long-tailed field-mice. These are the «wood-mice,» «deer-mice» and «cotton-mice,» more familiar under the old name *Hesperomys,* and commonly represented by the white-footed mouse (*P. americanus,* or *H. leucopus*), which occurs all over the more temperate parts of the continent. This species is somewhat larger than the house-mouse, and is yellowish brown above, darker on the back, the lower parts of the body and tail and the upper surface of the feet white; the young are dark slaty; the eyes and ears are large, and the fur long and soft. It is nocturnal in its habits, as active as a squirrel, nesting in trees, in the fields, in barns and houses, and making a dwelling resembling a covered bird's nest; it feeds principally on grain, seeds, nuts and insects; and in newly settled districts comes into dwellings and granaries and is as mischievous as the house-mouse. Species with similar habits are a beautiful golden-haired southern one (*P. aureolus*); the large, dark-brown, gray-bellied cotton-mouse (*P. gossypinus*), very numerous in the South Atlantic States; the «red-backed» or Michigan mouse (*P. michiganensis*) of the North Central States, and several others.

Bibliography.— Coues and Allen, 'Monograph of the Rodentia' (Washington 1877); Merriam (and others), 'North American Fauna' (Washington 1889 and subsequently); Stone and Cram, 'American Animals' (New York 1902); Ingersoll, 'Wild Life of Orchard and Field' (New York 1902); and the books of Audubon, Godman, Kennicott, Merriam, De Kay, Baird, Coues, Herrick and other naturalists.

ERNEST INGERSOLL.

MOUSE-BIRDS, a group of peculiar birds of central Africa, constituting the family *Coliidæ* and the suborder Colii, and also known as colies. They are of small size, grayish colors, marked with darker tints and in some species with touches of brighter colors; have finchlike beaks, crests, short, weak wings, very long tails and remarkably strong feet. They are active, but fly little, spending their lives mostly in creeping about the branches of trees in a way that with their dun colors strongly suggests the behavior of mice. They are fond of hanging head downward, and at night gather in bands that roost together in hanging postures as closely as they can crowd. Their food consists mainly of fruit; and they place their cup-shaped nests in low trees and bushes.

MOUSE-DEER. See CHEVROTAIN.

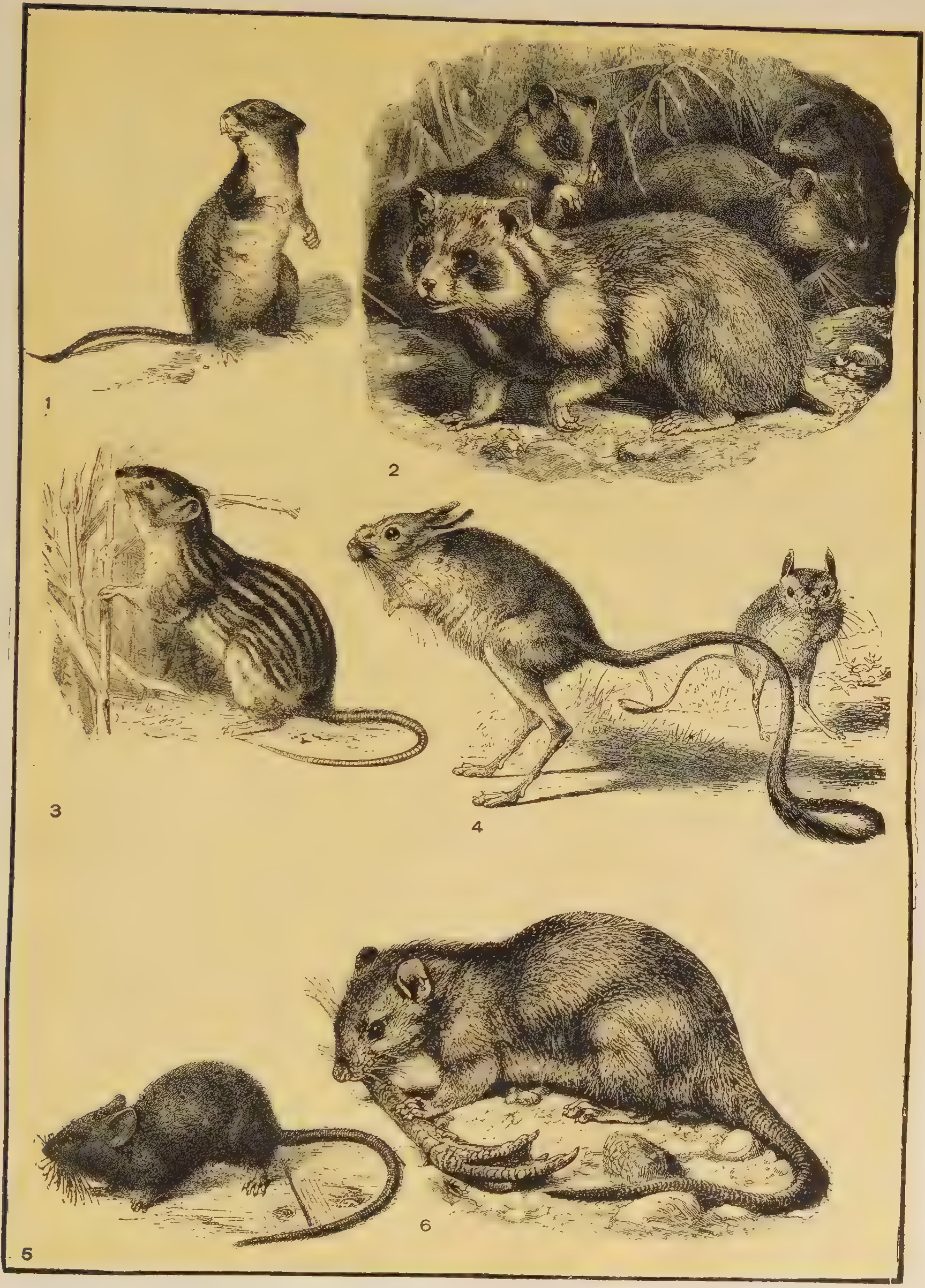
MOUSE-EAR, the name of various small plants, suggested by the shape and appearance of the leaves: (1) a borage of the genus *Myosotis,* more generally known in the United States as «forget-me-not» or sometimes «scorpion-grass,» small furry herbs, growing in damp and shady places through the temperate regions and bearing clusters of minute blue and white, «yellow-eyed» flowers. (2) The marsh cudweed or wartwort (*Gnaphalium uliginosum*). (See CUDWEED). (3) One of the wound-worts (*Stachys germanica*). (4) Any of several chickweeds (q.v.), especially the widely scattered *Cerastium viscosum.* (5) The cats-foot, or plaintain-leaved everlasting (*Antenneria plantoginafolia*). (6) A European hawkweed (*Hieracium pilosella*). (7) The cruciferous plant *Sisymbrium Thaliana.*

MOUSE-LEMURS. See CHIROGALE; LEMUR.

MOUSTERIAN STAGE, a period in the history of Paleolithic man in southwestern Europe when men had made considerable advancement in the arts of working in flint and other stones, and in the graphic arts. See STONE AGE.

MOUTH (oral or buccal cavity), primarily the nearly oval cavity at the commencement of the alimentary canal or digestive tract, into which food is taken, and from which the voice issues. In humans the mouth is the source of much gratification of the unconscious libido (q.v.) in children, a remnant of the nursing days; and in adults for this reason, the habit

MICE



1 Harvest Mouse
2 Hamster
3 Barbary Mouse

4 Jerboas
5 House Mouse
6 Brown Rat

of taking into the mouth, or chewing anything not food is to be regarded as a survival into later days of a characteristically infantile trait. A possible exception to this is kissing which is customarily retained in most civilized races as an expression of affection.

MOUTH, Diseases of the. The principal diseases of the mouth may be classified as follows: Inflammation of the mucous membrane and its results; epulis, gumboil, ranula, salivary calculus and salivary fistula.

Inflammation of the Mouth (Stomatitis). — This disorder is usually caused by local irritants, such as scalding drinks, corrosive substances, jagged teeth or tartar. Suitable remedies are: Cooling and demulcent washes, soft food, building up of the strength and removal of tartar or other sources of irritation. Inflammation invading the mucous follicles, usually in debilitated children or from the irritation of teeth or as the result of an eruption (herpes) is follicular stomatitis. It is attended with thin spots of white exudation, but there is no breach in the surface of the mucous membrane. The patient swallows with difficulty; the mouth is hot and tender; the submaxillary glands may be swollen. The remedies are as above given, with the addition of a disinfectant to the mouth-washes. The terms aphthæ and thrush (q.v.) are given to a stomatitis, usually follicular, attended by curd-like exudations with ulceration beneath the exudates (ulcerative stomatitis). The disease may be conveyed to the nipples of the nursing woman. In true aphthæ the exudations are due to a microscopic fungus, the *Oïdium albicans*. In treatment the child is to be carefully fed, its mouth kept clean and disinfected and the bowels regulated. Borax or tincture of myrrh, well diluted, is a good mouth-wash. Do not use honey. Canker refers to isolated superficial ulcerations of the mucous membrane, usually the result of debility and dyspepsia. Remedy these two conditions and touch the spots occasionally with nitrate of silver. Gangrenous stomatitis (noma) or cancrum oris means a more or less sloughing ulceration, usually upon the gums or cheeks. The breath is fetid; there is great swelling with soreness, high fever, marked debility, etc. It may follow measles or some other debilitating blood-disease. The treatment requires a physician.

Epulis.— This is a smooth round or lobular tumor springing from some portion of the alveolar processes and the periosteum covering them, usually from the lower jaw. It is more frequent in women, and may be caused by irritation from decayed teeth.

Gumboil.— The gum-disease so named is a circumscribed inflammation of the mucous membrane or of the periosteum covering a portion of an alveolar process, caused usually by a decayed tooth. Wash the mouth frequently with hot water, have the boil lanced or cause it to discharge by applications of hot figs (boiled in milk) and have sources of irritation removed.

Ranula.— This term denotes a cystic formation in the mucous membrane beneath the tongue, sometimes originating in the duct of a sub-lingual or submaxillary gland. It is either congenital or acquired. Treatment consists in the excision of the cyst, generally through the mouth and rarely through an incision under the jaw.

Salivary Calculus.— Such is the name given to a concretion, mainly of phosphate of lime, formed in the duct of one of the salivary glands, but rarely in the glands themselves. Sometimes it forms around a foreign body, such as a seed or a bit of food or tartar, and sometimes produces a ranula.

Salivary Fistula.— A fistula of this character is an abnormal canal opening upon the cheek, and arising from the duct of the parotid gland as the result of ulceration.

MOUTON, moo-tŏn′, **Alexander,** American politician: b. Bayou Carencro, La., 19 Nov. 1804; d. near Lafayette, La., 12 Feb. 1885. He was graduated from Georgetown College, District of Columbia, and in 1825 was admitted to the bar. He was elected to the State legislature in 1826 and in 1831–32 he was speaker. He was presidential elector in 1828, 1832 and 1836, and was elected to the United States Senate in 1837. He was governor of Louisiana in 1843–46, and later presided over various conventions, but retired to plantation life at the outbreak of the Rebellion in 1861, upon failing to be elected to the Confederate senate.

MOVABLE BRIDGES. See BRIDGE CONSTRUCTION, MODERN METHODS OF.

MOVEMENT-CURE. See SWEDISH MOVEMENT CURE.

MOVILLE, Ireland, town and seaport in the county of Donegal, at the mouth of Loch Foyle. It is a port of call for the Glasgow-New York steamers of the Anchor and Allan lines, as well as a favorite bathing resort. Pop. 1,016.

MOVING PICTURES are produced by lantern projection on a screen, of a series of pictures in such rapid succession that the eye sees them as one continuous representation. The possibility of such pictures depends upon what might be considered a defect of the human eye, known as the «persistence of vision»— the technical name for the lingering on the retina of an impression received, after the excitation which produced the impression has passed. This lingering of the impression is sufficiently long to tide over the gap of one-sixtieth to one-eightieth of a second during which there is no picture on the screen. So that if the mechanism of human vision was perfect the illusion of the moving picture would be impossible.

It has been determined by experiment that the duration of the persistence of vision averages one-fiftieth of a second and it was calculated that 14 pictures per second would be needed to produce a continuous impression upon the eye — assuming each picture to occupy the screen for three-fourths of its allotted share of the second, the other fourth being the gap of darkness while the film was moving forward to the next picture. With the improvement of the exhibiting mechanism, however, the number of pictures per second was increased to 16, the length of time each is on the screen being one-twentieth of a second, and the dark gap between being reduced to one-eightieth of a second. In this way the presentation has been made much smoother and the former unpleasant flickering eliminated.

The fact that moving pictures are projected on a screen by means of an optical lantern (q.v.) has already been referred to. This lantern with the film moving mechanism is called the kinetoscope or kinetograph (and numerous other names). The lantern part is of the same general type as the magic lantern, being equipped with a brilliant light (usually the electric arc) and a projection lens by which the image is enlarged upon a screen. The moving-picture lantern, however, is a very highly complicated apparatus as compared with the magic lantern, for, instead of the simple lantern-slide pushed into place in the field of the lens of the latter and left there as long as desired, the kinetograph mechanism must bring its long series of thousands of pictures one by one into place with the most exquisite accuracy, opening the shutter when the picture is ready and closing it while another is being moved into place, and all at a speed so rapid that the human eye is unable to follow the motion.

One of the requirements arising from this great rapidity of movement is that the individual pictures must be very small — a large picture could not be moved fast enough without the destruction of the film on which the pictures are carried. These physical conditions have resulted in fixing the workable size of the kinematograph pictures at one inch in length by three-fourths of an inch in height. The magnification of this little picture on the screen is therefore about 10,000 times its original area — which suggests the extreme perfection in the picture itself as well as in the projection apparatus. These little pictures are arranged continuously one above another on a strip of perfectly transparent horny material resembling celluloid. The strip is one and three-sixteenths of an inch in width and may be any length desired — generally ranging from 120 feet to 1,000 feet. The pictures occupy the centre of the strip and in the margins on both sides are square-cut perforations by which the movement of the strip in the lantern is accomplished through sprocket wheels and hooks.

The pictures themselves are produced by photography, on a coating of sensitized gelatine spread upon the strip of film, and the pictures are photographic positives printed from negatives on a similar strip made in a special moving-picture camera which will be briefly described farther on in this article. For exhibition with the lantern the film is rolled on a spool or reel and fed in a loose loop by a series of sprocket wheels and idlers to the «gate,» as it is called, through which the light passes to the screen. The gate carries a mask which cuts down the size of the picture actually illuminated and projected to fifteen-sixteenths of an inch in length and eleven-sixteenths of an inch in width. The film is pressed against this mask firmly but gently by delicately acting springs. The movement of the film is downward through the gate and is accomplished by a pair of hooks just below the gate, framed together so that they will accurately engage the perforations in the margin of the film, one hook of the pair on each edge of the film. These hooks are operated by a revolving cam which causes them to move forward into the perforations; then to move downward, pulling the film with them just the height of one picture; then to move backward out of the perforations, and then upward to their first position. The cam is so fixed that the pull downward on the film occupies about one-fifth of the complete cycle of the movement of the hooks. During that period of one-fifth of the time allotted to one picture — one-sixteenth of a second — the shutter which revolves in front of the projection lens shuts off the light from the screen for the eightieth of a second; when, the next picture being in position, the shutter allows the light to pass to the screen for four-eightieths of a second — the entire operation being repeated for the next picture. And thus the operation goes on, 16 times per second until the film has all been run. As the pictures run 16 to the foot of film, a short film of 120 feet, containing 1,920 individual pictures, will be run off in two minutes. A 1,000-foot film, with 16,000 individual pictures, will occupy nearly 17 minutes. As the film which has been shown passes the hooks it is gathered by sprocket wheels and passed to a receiving reel on which it is wound for storage and from which it must be rewound before it is in proper order for another exhibition. The entire mechanism of the lantern is operated by the handle turned by the operator. In some instances electricity has been used in place of hand power, but the latter is relied on in the great majority of cases. Fig. 1 shows the relative arrangement of the carbons, the condensing system of lenses, the gate with the film passing downward through it from the full reel box to the empty one, propelled by the sprocket wheels. The projecting lens is shown between the reels. The drawing is skeletonized in order to show simply the essentials of the moving picture lantern.

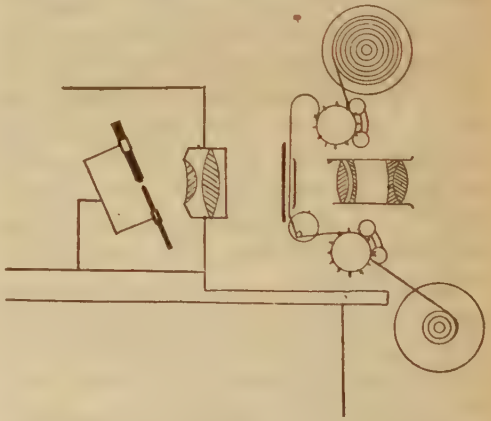
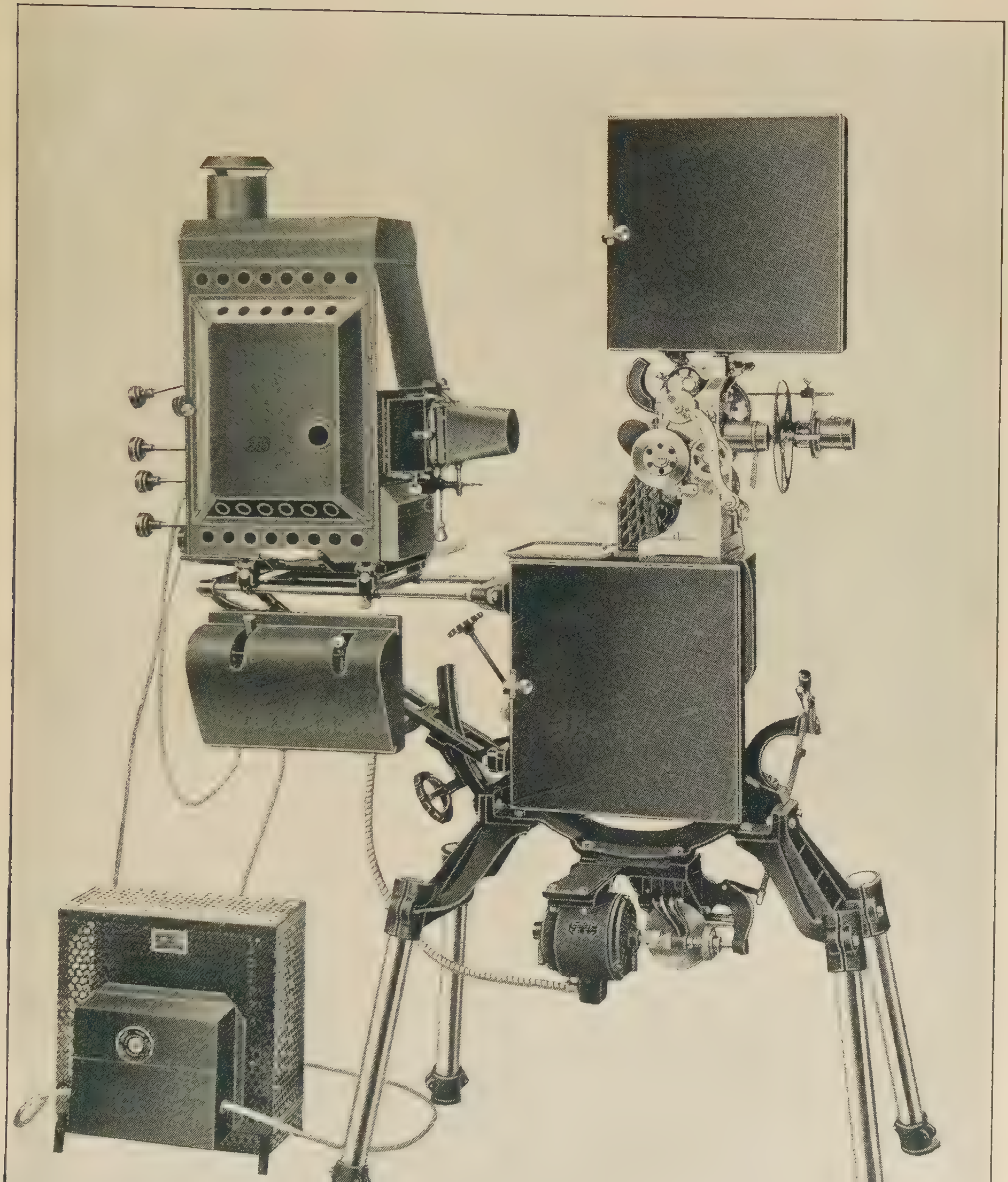


FIG. 1.— Sectional Diagram of the Film Moving Mechanism and the Lens Systems of the Moving Picture Lantern.

A comparatively recent contribution to the steadiness of the picture on the screen is the narrow, transparent violet vane placed on the shutter frame opposite the opaque sector. In spite of the brevity of the dark gap there was a certain letting down of brilliancy, noticeable to the eye toward the close of the dark gap which was emphasized when the light came on again in full force, and these closely following contrasts proved very tiring to the sight. The violet vane, by cutting into the high brilliancy,



POWER'S CAMERAGRAPH, WITH MOTOR DRIVE

reduces the representation to a slightly lower but more uniform illumination. Other important accessories of the lantern are the heat screens, which stop a large proportion of the intense heat rays inherent in the condensed light from reaching the film and injuring the pictures. One ingenious device provides for the complete intercepting of the light and its contained heat unless the film is passing through the gate at a speed sufficient to protect it. Another closes this «fire shutter,» as it is called, instantly in case the film breaks.

When all is said, however, the exhibition of moving pictures is simplicity itself as compared with the intricacies of making them in the first place. The processes of photography in any case require for success an extreme nicety of adjustment of many factors. It is a praiseworthy feat to secure a single excellent «snapshot.» The task of the moving-picture photographer is to take thousands of pictures of such uniformity as to appear one continuous view, and of such excellence in definition and depth of focus as to be capable of magnification 10,000 times and still be satisfactorily sharp and clear. And all this is to be done often where the lighting is beyond control, where the only available position for the camera is one that no photographer would willingly choose, and where swarming crowds of bystanders seem to vie one with another to thwart the design of the camera man.

The camera which has been designed to overcome all these external difficulties and many others peculiar to moving-picture work is a marvel of ingenious adaptation and mechanical skill.

Of supreme importance in the kinetograph camera is the lens, which is so designed as to admit the largest amount of light consistent with sharpness of definition and with the shortest practicable focus. The factors of the lenses usually employed in taking moving pictures are for the focal length, 2 to 3 inches and for the working aperture f/3.8 to f/3.1. One prominent lens house has produced a lens of 3¼-inch focus and a working aperture of f/1.9, with which have been made some very successful films under the most adverse conditions of lighting. It is not to be understood that the lens is habitually used at its full aperture. This is the rule only in extreme cases of underlighting. The usual aperture employed in good light is f/16. Next in importance to the lens is the shutter which must be capable of adjustment with the utmost nicety to control the length of time the light transmitted by the lens is to act on the sensitive film. The shutter makes one revolution for each picture taken, that is, ordinarily, one-sixteenth of a second.

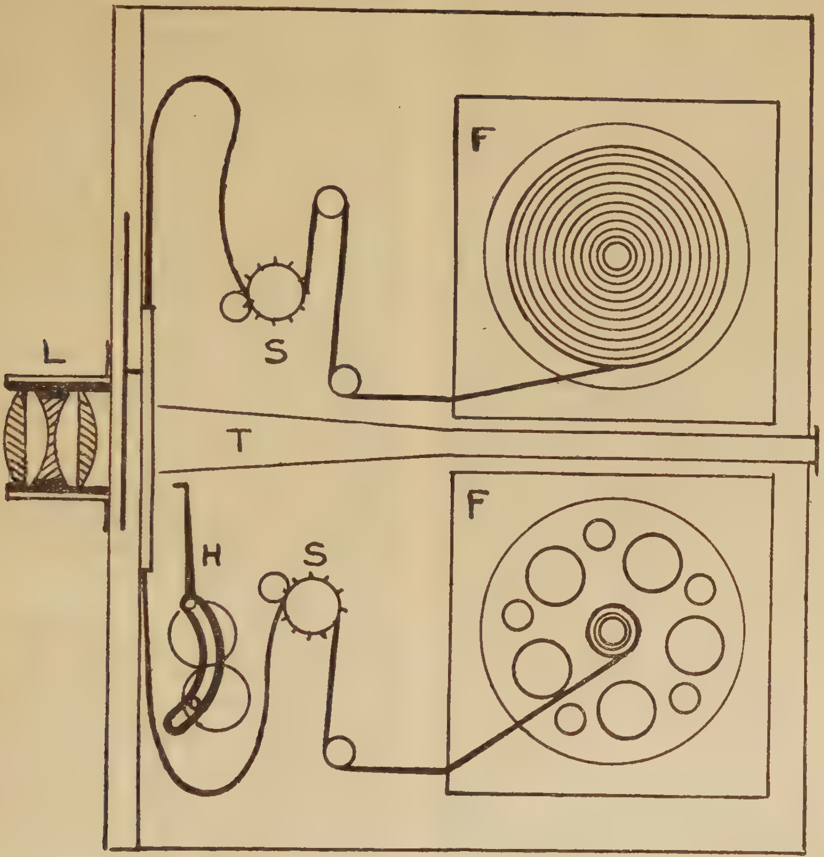


Fig. 2. — Sectional Diagram of the Moving Picture Camera.

The larger part of the disc of the shutter is opaque, one section being cut away to admit the light to the film as it passes the gate. This cut-away sector is adjustable in size of opening, so that for quickly-moving subjects the actual time of exposure may be reduced to a very small fraction of a second. With moving pictures, however, extreme sharpness of the subjects in motion is not a necessity, a slight blurring being rather an aid to the general optical illusion.

The interior of the camera otherwise resembles in fittings the exhibition lantern, except that everything about it is in light-tight compartments. A large reel carries the sensitive film before it is exposed and another takes it up afterward. The hook contrivance for moving the film at the gate and the arrangement of sprocket wheels and idlers to keep it in motion are practically the same, and the entire mechanism is worked by the crank turned by the camera man. Fig. 2 shows the actuating mechanism which operates the film, without the gear-wheels which connect it with the driving crank. F, F, represent the film cases, the upper one full of new film. The sprocket wheels, S, S, turn so as to keep the film in loops with no strain on the hook H. L is the lens with the pivoted shutter behind it and T is the focusing tube. Other devices, however, are attached to the head of the heavy tripod which carries the camera while it is being operated. There is a gearing which swings the camera around slowly on a horizontal plane, and so enables the camera man to make a panoramic view or to follow a moving subject with his lens. A finder at the side of the camera gives him continually the exact view which is being impressed upon his moving film. For a view which lies above or below the plane on which the camera is standing there is a tilting device by which the horizon of the picture is kept in a level position. Both of these movements are made by cranks at the left of the operator and turned with his left hand.

In making usual exposures the exposing crank is turned steadily and with skilled uniformity 120 times a minute, each turn of the crank making eight exposures on the film. The exposed film is removed from the camera in the dark room and wound upon a «pin frame.» This is a square frame, generally of brass, with diagonal and semi-diagonal spokes radiating from the centre, each studded with pins slightly longer than the width of the film. Starting at the centre of the frame the film is wound around and around in an ever-widening spiral which offers free play between the coils for the developer. Before compounding the developer a test is made upon a few inches of film clipped from one end, and according to this test the developer is prepared with such developing agents as promise the best results. The developing agents usually employed are metol and hydroquinone in combination. Glycin and eikonogen are also used. The pin frames with their coils of film are immersed edgewise in an upright bath. The development aimed at is one that will give the widest contrast of highest light and deepest shadow, with a full range of intermediate values in soft gradations. Hydroquinone is depended on to give the first quality and metol the second. When thoroughly fixed and washed the negative is wound upon a large revolving drum to dry.

The positive film used in the exhibiting lantern is made from the negative by a photographic printing process. This positive film is perforated exactly like the negative film, but is coated with a much slower emulsion and contains a larger proportion of silver chloride salts, so that the development of the positive produces blacks of greater opacity, yielding pictures of more contrast and brilliancy. The negative and the unexposed positive film are placed face to face, the perforations matching, in the printing camera and are pulled downward together by the hook mechanism through a gate, in front of which is an artificial light, commonly an incandescent electric lamp. A revolving shutter at the gate cuts out the light while the film is being moved and makes the exposure while it is stationary, at the rate of from five to eight exposures per second; and this is kept up until the negative film has all been printed. Another reel of positive film may then be attached and another printing made — and so on for as many positives of that subject as are required. It is to be noted in passing that no two negatives can be relied on to require exactly the same amount of light in printing. Skilled judgment must determine the speed and opening of the shutter which will produce the best results.

The development of the positive film is conducted in exactly the same fashion as with the negative film, but the light used is much stronger. An orange light is perfectly safe with a positive film. The progress of the development is closely watched by examination before the light, and the process is stopped when the necessary density is obtained — a matter to be determined by the trained judgment of the operator. The film is then rinsed, fixed and hardened and washed absolutely free of hypo before drying. There may be, if desired, further treatment by tinting or toning to produce certain scenic effects. In tinting the whole film is passed bodily through a bath of some dye which imparts its color to the gelatine pellicle, but does not alter the black of the silver deposit. For example, a blue hue is given for a moonlight effect, pink for sunrise; yellow-brown for lamplight; red for firelight, etc. In toning the silver deposit itself is chemically changed in color, the clear part of the film remaining unchanged. Some beautiful effects in sepia, green, indigo, etc,, are thus produced.

The greater part of the films produced and exhibited at the present time are those which delineate what might be called picture-stories. Along with a large number of comic and farcical subjects there are pretentious pantomimic plays — of the type known as «photoplays» (q.v.). Some of these have engaged the talents of actors and actresses in the front rank of their profession. In addition to these presentations of theatrical proportions, vast imaginative and historical pageantries have been «staged» out of doors, with thousands of performers and a wealth of artificial scenic accessories running in value to many thousands of dollars — all to produce the one master negative. In not a few cases whole companies of performers have been transported to some far-distant locality in order to secure the appropriate «local color» for the film-play. The moving-picture mechanism lends itself readily to an endless variety of trick pictures, through the facility with which a film may be cut and joined to another set of pictures, showing no break on the screen. For example, a magician may be seen to touch the «villian» with his wand, and instantly he becomes a mammoth wriggling caterpillar — through the simple joining of the two distinct films. As films may be run backward as well as forward the most remarkable extravaganzas may be produced. A wall may be seen to build itself from a pile of bricks — the picture actually taken having been the demolition of the wall. A picture of a man climbing down a fire-escape rope may be shown on the screen as one climbing up the rope.

While the majority of films are made for purposes of entertainment, the moving picture has an extensive use in the commercial world by salesmen of machinery and mechanical appliances, who are thus enabled to show their products at work in any part of the country where they may fill a need. Much educational work has been done with the aid of the films; manufacturers have used them to display fashions in dress; social organizations for the spread of their peculiar propagandas; and charitable institutions to arouse interest in their work. In scientific research it has also played a large part. The combination of the microscope and the moving picture camera has revealed an entirely new field of interest in the invisible world. The growth of plants has been studied by a series of exposures lasting over several weeks in the opening of a flower, and covering months in the growth of a stalk of corn. In securing these films the exposures are not made continuously as in ordinary camera work. In the case of the corn, which may take 90 days to mature, the separate exposures are made at such intervals as to give a film of perhaps 2,880 pictures in all, which will occupy the screen for just three minutes in its exhibition. The telephoto lens has also been combined with the moving picture apparatus, permitting pictures to be taken at a distance from the subject. Thus the actions of wild birds and animals have been recorded. Some of the most interesting films have shown the emerging of the butterfly from its chrysalis; the silkworm spinning its cocoon; a snake shedding its skin; a war of enemy tribes of ants; and many such incidents.

A very important application of the moving picture idea is the study of the movements of highly skilled mechanics at their work, particularly in factories. A tiny electric light is attached to the hand, or other moving part, and its trace on the moving picture film affords a diagram from which wire forms or guides are constructed. Unskilled workmen are taught by these forms to learn the motion which gives greatest efficiency in production. The introduction of a clock into the picture permits the measurement of the actual time consumed in making each movement or part of a movement, with the accuracy of one-millionth part of an hour. The moving picture camera has also been used to study the movements of expert typewriters and piano players. In surgery it is used to observe defective or abnormal motions after operations; and the makers of artificial limbs use it to secure the nearest possible counterfeit of the normal movements of sound members.

The moving picture business has settled into a triplex organization: (1) the producers of the picture films; (2) the exchanges, or distributing middlemen; (3) the exhibitors. In the United States in 1921 there were 127 establishments producing films; employees were 10,659; salaries, etc., $37,693,000 and value of products, $77,397,000. The recent tendencies have been toward the combinations of the larger producing companies, and the establishment of the new combines of branch houses throughout the country, acting as distribution centres. And many of the former middlemen have become producers on a small scale.

Figures as to the attendance at the moving picture theatres cannot be given with any degree of accuracy. The number of the smaller houses, those seating about 300, is constantly diminishing, but the continued building of larger houses keeps the seating capacity about the same as in the days of the multitudinous «nickelodeon.» It is officially reported (for purposes of taxation) that the gross annual income of the moving picture theatres aggregates $275,000,000.

A considerable factor in the business of producing films is the large export trade. In spite of the many difficulties on account of the war, the high-water mark in film exportation was reached in 1916, when 136,141,137 feet of film pictures, valued at $6,051,031, were sent abroad. In 1922, 138,800,718 feet were exported.

Bibliography.— American Motion Picture Directory, 1914–15; Bennett, C. N., ‹The Handbook of Kinematography› (London 1911); Croy, ‹How Moving Pictures are Made› (New York 1918); Dench, E. A., ‹Making the Movies› (New York 1915); Hulfish, D. S., ‹Motion Picture Work› (Chicago 1915); Jones, B. E., ‹The Cinematograph Book› (London 1915); Lomas, H. M., ‹Picture Play Photography› (London 1914); Talbot, F. A., ‹Practical Cinematography and Its Applications› (London 1913); Horstmann, H. C. and Tousley, V. H., ‹Motion Picture Operation› (Chicago 1914).

RICHARD FERRIS,
Editorial Staff of The Americana.

MOVING PICTURES, Censorship of. Since the beginning of the 20th century the development of the film-drama, or moving picture, has revolutionized amusements in America. With low prices, the attendance has become enormous, and the influence upon society is more portentous than either that of the church or the spoken drama. For millions of people the moving-picture supplies the place of sermons, books, pictures and travel. In the early years of its development the selection of subjects for presentation was made by the proprietors, who were not averse to presenting horrible crimes and indecent scenes.

The early film dramas were very simple and very crude from a dramatic viewpoint. They were followed by plays of some depth dealing with the questions of the day. These were followed in turn by plays showing the features and ramifications of the white-slave traffic, drug addicts, robberies, etc. Many of these failed utterly to teach the moral lesson which could be the only excuse offered for their presentation; on the contrary, competent authorities pointed out the grave dangers inherent in such crude, bold presentations of depravity and crime. The evil became so great that a private society in New York looked into the matter and after consultation with the producers of films persuaded them that the approval of a board of censors would enhance the demand for a film.

In 1909, therefore, was organized the National Board of Censorship (now the National Board of Review) in New York City at the demand of many exhibitors of films. This board was a voluntary group from the Peoples' Institute. No member had any financial or other connection with the moving-picture business, being drawn instead from professional and business men and women, social workers and others interested in civic and social betterment. The members serve without compensation; there is, however, a paid secretary and clerical staff. Over 100 members serve on the censoring committee, and on an average review 25 films, averaging 5,000 feet, each day, and requiring, if exhibited successively on one machine, 41 hours and 40 minutes for presentation. The film is viewed by one or more members of the censoring committee of the board in the producer's studio, after which the film is approved *in toto* or recommendations are made in regard to certain scenes, which are thereafter eliminated altogether or revised so as to remove the objectionable features pointed out by the reviewers. At the end of every film so reviewed there is attached the legend «Passed by the National Board of Review.» Its work in the years following its organization proved so successful that exhibitors the country over highly appreciated it and the board increased its scope, soon becoming national in extent, increasing its control over the film output in all parts of the United States and co-operating with small local boards in various cities. Its work at present is so organized that it passes upon over 95 per cent of all films produced, and of this amount about 90 per cent receive the board's immediate approval. The board is unofficial and merely recommends changes or alterations deemed desirable in a film, but it possesses no legal power to enforce its recommendations. The necessity for a board with broader powers has influenced several States to pass legislation to this end, but in every case the constitutionality of such legislation has been questioned, its opponents maintaining that censorship is un-American, and the aims of such legislation are secured by the ordinary police power governing public morals, etc.

The work of the national board, however, has given fairly satisfactory results, its uniform system of passing upon photo-dramas giving it a decided advantage over local boards or State commissions, the latter seldom working in harmony. The need for a Federal board with broad powers has been emphasized in recent years, and certain parties have carried on an agitation with a view of securing Federal legislation for its creation. An attempt of this kind in 1915 met with signal failure. Producers and exhibitors have maintained a firm front of opposition against censorship of any kind, on the ground, as stated above for the local bodies, that the police and municipal authorities are already possessed of adequate powers to deal with questionable or immoral plays. Among the churches, the Roman Catholic has instituted a board which publishes regularly a list of approved photo-plays, condemning the baser kind by silence. In many cities ordinances are in force requiring the license of moving-picture houses and empowering the police or municipal authorities to close such houses as continue to exhibit pictures which have been condemned by the board of censors. On 31 July 1912 an act of Congress was passed prohibiting the interstate transportation of films representing prize fights. The license plan has so far proved inadequate to protect public morals and many cities are following the example of Chicago, where the chief of police appoints a committee which passes on all films shown in that city.

MOVING PLANT, an East Indian leguminous plant (*Desmodium gyrans*), remarkable for the motions of its pinnate leaves. The large terminal leaflet becomes more or less horizontal under the influence of light and heat, and is depressed during darkness or cold. Besides the movement of rising and falling, it has also a lateral oscillatory motion with a period of two to four minutes, so as to occupy an oblique position relative to the leaf-stalk. The smaller lateral leaflets, of which there are one or two pairs, also exhibit jerking movements, approaching and retiring from each other, and these motions proceed to a limited extent during darkness. Gray describes 20 species of *Desmodium* in the flora of the United States, without mentioning that any of them exhibit such movements.

MOWAT, Sir **Oliver,** Canadian statesman: b. Kingston, Ontario, 22 July 1820; d. Toronto, 19 April 1903. He was educated in Kingston and Toronto, studied law in Kingston and began practice in that city, afterward moving to Toronto. He took high rank in his profession, especially as an equity lawyer. In 1856 he was appointed Queen's Counsel, and from that date until 1859 he served as a member of a commission appointed to revise and consolidate the statutes of Canada and Upper Canada. From 1857 to 1864 he was in the legislative assembly of United Canada, and in 1858 was provincial secretary. In 1863–64 he was postmaster-general, and in the latter year he served in the Quebec Conference, as one of the Fathers of Confederation from Upper Canada. From 1864 to 1872 he was vice-chancellor of Upper Canada, in the latter year, on the urgent solicitation of the Liberal leaders in the province, retiring from the bench to re-enter political life. From that date until 1896 he was premier of Ontario, holding office with conspicuous ability for 24 consecutive years. In his first session (1873) he passed the Municipal Loan Fund Act, which put an end to the financial muddle caused by frenzied municipal aids to railway construction at an earlier period. To him is largely due the credit of the revision and codification of the provincial laws, embodied in ‹The Revised Statutes of Ontario, 1877.› He was brought into conflict with Sir John A. Macdonald on the question of provincial autonomy, Mowat regarding the provincial legislature as sovereign within its own sphere, and his reading of the British North America Act was in this connection borne out on repeated occasions by the

Imperial Privy Council, notably in the Ontario boundary dispute. In 1896 he entered the Laurier ministry as Minister of Justice, and was president of the senate. In 1897 he was appointed lieutenant-governor of Ontario. Altogether, Mowat gave 45 years to the public service. He was created K.C.M.G. in 1892. Consult Biggar's 'Life of Sir Oliver Mowat' (2 vols., Toronto 1905).

MOWATT, Anna Cora. See Ritchie, Anna Cora Ogden Mowatt.

MOWBRAY, mō'brā, **George W.,** American inventor: b. Lewes, England, 1815; d. North Adams, Mass., 21 June 1891. He studied chemistry in England, came to America in 1853, worked in the California gold-mines until 1858, in the Pennsylvania oil-country until 1868, and then at North Adams, where he perfected the commercial use of nitroglycerin, and invented a smokeless powder. He was consulting chemist to the Maxim and Nordenfelt Arms Company.

MOWBRAY, H(arry) Siddons, American artist: b. Alexandria, Egypt, 1858. He was brought to the United States in early childhood and educated in North Adams, Mass. He studied one year at West Point. In 1878 he entered the studio of Bonnat, Paris, and subsequently settled in New York as a figure painter and decorator. He is a member of the Society of American Artists, was the first director of the American Academy at Rome, and was elected a National Academician in 1891. He is especially noted for his mural decorations in the library of the University Club, New York, and elsewhere. He was awarded the Clark prize by the National Academy in 1888.

MOWBRAY, J. P., a pseudonym of Andrew Carpenter Wheeler. See Wheeler, A. C.

MOWER, Charles Drown, naval architect: b. Lynn, Mass., 5 Oct. 1875; educated in the Lynn public schools. After serving for four years in the offices of Arthur Bundy and R. B. Crowinshield, naval architects, at Boston, he went to New York to take the position of designing editor of *The Rudder*, the yachting magazine. In the seasons of 1903–04 he was official measurer of the New York Yacht Club, measuring the yachts *Shamrock III* and *Reliance* for the American cup races of 1903. Is a member of the Society of Naval Architects and Marine Engineers, and of many yacht clubs. Among his works are 'How to Build a Motor Launch' (1900); 'How to Build a Knockabout' (1901); 'How to Build a Racing Sloop' (1901); 'How to Build a Cruiser' (1903).

MOWER, mō'er, **Joseph Anthony,** American soldier: b. Woodstock, Vt., 22 Aug. 1827; d. New Orleans, 6 Jan. 1870. He was educated in the common schools and Norwich University, enlisted as a private in the Mexican War and in 1855 was commissioned 2d lieutenant. He was promoted captain in 1861 and for bravery in action was made major in 1862. He soon passed through all the ranks up to that of brigadier-general, and in 1863 commanded a brigade at Vicksburg. In 1864 he was in charge of a division under General Banks in Louisiana and he accompanied General Sherman in his Georgia and Carolina campaigns and received promotion to the rank of major-general. He remained in the army after the war with the permanent rank of colonel, and was in command of the department of Louisiana at his death.

MOWRER, Frank Roger, ex-consul-general; b. Xenia, Ohio, 7 July 1870. He received the title of LL.B. at Cornell in 1894 and was admitted to the bar the following year. In 1897 he decided to enter the consular service, in which he continued for 12 years, holding many important posts in that period of time. The record of his service is as follows: Marshal of the consular court at Yokohama 1897–99, from which he retired by operation of the treaty; marshal at Canton, 1899–1900; consul at Antigua, from January to October 1901; at Ghent, Belgium, 1901–06; consul-general at Abis Ababa, Abyssinia, 1906–07; consul at Leghorn, Italy, from April to June 1907; consul-general at Copenhagen, Denmark, 1907–09, from which he resigned in the latter year and returned to the United States.

MOWRY, mō'rĭ, **William Augustus,** American educator and author: b. Uxbridge, Mass., 13 Aug. 1829; d. 22 May 1917. He was educated at Brown University and in 1862–63 was a captain in the Federal army. He was principal of the English and Classical school in Providence in 1864–84 and in 1884–85 edited the *Journal of Education*. In 1886–91 he was editor of *Education*, and from 1887 to 1905 was president of the Martha's Vineyard Summer Institute. Among his writings may be mentioned 'Nathaniel Mowry and His Descendants' (1878); 'Richard Mowry: His Ancestors and Descendants' (1878); 'Studies in Civil Government' (1887); 'Elements of Civil Government' (1890); 'Talks with My Boys' (1892); 'A History of the United States' (1896); 'The Uxbridge Academy: a Brief History' (1897); 'First Steps in the History of Our Country' (1898); 'American Inventions and Inventors' (1900); 'Marcus Whitman and Early Oregon' (1901); 'The Territorial Growth of the United States' (1902); 'American Heroes and Heroism' (1903); 'American Pioneers' (1905); 'Essentials of United States History' (1906); 'Recollections of a New England Educator' (1908); 'Descendants of John Mowry of Rhode Island' (1909); 'Camp Life' (1914), also many papers, addresses, magazine, book and encyclopedia articles.

MOXOM, Philip Stafford, American Congregationalist clergyman: b. Markham, Canada, 10 Aug. 1848; d. Springfield, Mass., 13 Aug. 1923. During the Civil War he served as «captain's boy» (1862), enlisted in 1863, and served till 1865. At the close of the war he entered upon a course of study at Kalamazoo College, Mich., and later studied at Shurtleff College, Ill. (1868–70). Being ordained to the Baptist minitsry in 1871, he studied at Rochester Theological Seminary from 1875 to 1878, and was graduated from Rochester University in 1879, with the degree of A.B. From 1879 to 1885 he was pastor of the First Baptist Church of Cleveland, Ohio; and from 1885 to 1893 at First Baptist Church of Boston, where he gained a reputation as a preacher of marked power. In 1894 he joined the Congregationalists and became pastor of the South Congregational Church at Springfield, Mass. In November 1915 he resigned and became pastor emeritus. From 1894 to 1897 he was university preacher at Harvard, and preached frequently at other universities and colleges. He delivered the centennial address on the 100th anniversary of the birth of Browning, in the Brooklyn Institute, 7 May 1912. He was at the World's Parliament of Religions, and presented a paper on 'Immortality'; he was also at the World's Peace Congress, and was delegate to several international peace congresses. He attended the first Ecumenical Council in the interest of international amity at Constance, Baden, in August 1914, which was broken up by the war, but reassembled in London. He wrote 'The Aim of Life' (1894); 'From Jerusalem to Nicæa, the Church in the First Three Centuries' (1895); 'The Religion of Hope' (1896).

MOXON, mŏk'sŏn, **Edward**, English publisher and verse-writer: b. Wakefield, 1801; d. 3 June 1858. Going to London (1817) he entered (1821) the service of the Longmans, publishers. A volume of his verses appeared in 1826, and he started as a publisher in 1830, bringing out Lamb's 'Album Verses' as his first publication. He became publisher for Barry Cornwall, Southey, Wordsworth, Tennyson, Monckton, Milnes, Landor, Browning, etc. His second volume of poems appeared in 1837 and both were published together in 1843 and 1871.

MOYOBAMBA, mō-yō-bäm'ba, or **MOYABAMBA**, Peru, capital of the department of Loreto, on the Mayo River, 50 miles northeast of Chachapoyas. It is noted for its manufactures of Panama hats. It occupies an isolated position on a gravelly plateau intersected by deep ravines. Its chief communication is by river with Brazil, the Mayo as an affluent of the Huallaga connecting with the Amazon. Pop. 2,000.

MOZAMBIQUE, mō-zăm-bēk', South Africa, formerly the entire colony of Portuguese East Africa (q.v.); now one of its provinces and its capital town. The town of Mozambique is situated upon a small coral island near the coast. It contains the governor's palace, a cathedral, a hospital, a prison, warehouses, etc. The harbor is secure. Pop. 8,000. The population of the province in 1910 was about 362,000.

MOZAMBIQUE CHANNEL, the passage between the east coast of Africa and the island of Madagascar, about 1,050 miles long from northeast to southwest, 530 miles wide at its southern entrance, about 250 miles wide in the centre and nearly 600 miles wide at the northern entrance, where lie the Comoro Islands. The harbors of Mozambique and Beira are on its west shore.

MOZARABIC LITURGY, the liturgy used by the Mozarabs, or «spurious Arabs,» that is, the Christians who submitted to the Moorish government, in Spain, while retaining their own religion. This office is sometimes styled «Officium Gothicum» or «Isidori Missale,» because it was in vogue during the Gothic domination and was first revised by the great and learned Isidore of Seville in the 6th century. In Toledo after the gradual adoption of the Roman missal throughout Spain during the 11th and 12th centuries, Ximenes, cardinal archbishop of the see, revised in the 16th century the ancient office and built the beautiful chapel at the west end of the cathedral where the old Gothic ritual is still observed. It is supposed from the Greek affinities of its form, that the original liturgy was brought from Asia Minor by the Goths who dwelt south of the Bosporus in the 5th century. Consult editions by Lesley (Rome 1755); Lorenzana (Rome 1804); Migne, 'Patrologia Latina' (Vol. LXXXV and Vol. LXXXVI); also a new edition (Toledo 1875). Consult also Hammond, C. E., 'Ancient Liturgies' (Oxford 1879) and Neale, J. M., 'Essays in Liturgiology and Church History' (London 1863).

MOZART, mō'zärt (Ger. mō'tsärt), **Johannes Chrysostomus Wolfgangus Theophilus**, Austrian composer: b. Salzburg, Austria, 27 Jan. 1756; d. Vienna, 5 Dec. 1791. With this somewhat harsh combination of names Mozart was baptized on the day following his birth. His parents were Johannes Georg Leopold Mozart, and his wife, Anna Maria.

Until 24 years of age Mozart led a wandering life, being taken on several tours by his father, who, while himself fully appreciating the child's genius, chafed under the continuous disappointments resulting from the fact that it was not productive either of the appreciation or financial returns which it so richly deserved. But later the musical world recognized his powers, nor has there since his death been any stint of praise for his marvelous achievements. Mozart's genius was not merely the brilliant flash of a meteor, dazzling the world for a brief moment and then gradually flickering out. He did not earn his title of «musician of musicians» through one sublime effort in early life. Of him, perhaps more than of any of the other great composers, it may be truly said that his powers steadily increased as he grew older, a statement borne out by the fact that three of his greatest works were composed during the last year of his life.

Nor is this high estimate of his worth confined to those of the laity who since his time have been capable of appreciating his wonderful genius. All men, including his fellow artists, paid sincere homage to him as supreme in several of the departments of the musical art. Thus Rossini, on being asked who was the greatest musician, first replied «Beethoven»; but when the question was put «What of Mozart?» he answered «Mozart is not the greatest, he is the only musician in the world.» Again, Gounod in an address before the Académie des Beaux Arts in 1882 expressed his deep admiration for Mozart in the following words: «Oh, divine Mozart, . . . bounteous nature had given thee every gift; grace and strength, fulness and sobriety, bright spontaneity and burning tenderness, all in that perfect balance which makes up the irresistible power of thy charm, and which makes of thee the musician of musicians, greater than the greatest, the only one of all.»

This sounds like high praise, and that was what Gounod meant it to be. And so throughout the ages men will continue to recognize the genuine fire of genius which animated his compositions and which found its expression not only in his inimitable perception of the relation between the human feelings and the realm of tones, or in his inexhaustible power of interpreting widely different types of character, but above all in the superb beauty of proportion and balance which pervades his creations. Mozart was not only a brilliant composer, however, for he was also a remarkable performer on the piano, organ and violin. Haydn said that he could never forget Mozart's playing, for «it went to the heart.»

The number of separate published works ascribed to Mozart is 626, while he is also said to have written 294 compositions which were unfinished or unpublished. When only three years old Mozart showed evidences of his musical genius, perceiving which his father taught him minuets on the harpsichord and at four years he commenced composing. His first appearance in public was in September 1761, as a chorister in some theatricals held at the University of Salzburg. In his 6th year he composed his first published work — a ‹sonata pour claveçin.› When seven years old the Mozart family visited Paris, Wolfgang playing the violin and organ at several churches *en route*. Here he composed a Kyrie, his first sacred piece. Later in the year they went to London, where the boy's playing, and especially his power of improvising, excited the greatest admiration. In 1764, while in London, he produced 10 sonatas for the clavier and violin, six of which, dedicated to the queen, were brought out early in the following year. In January 1766, Wolfgang gave two concerts in Amsterdam, at which all the instrumental work was of his own composition. Later, on the occasion of the installation of the Prince of Orange as stadtholder, he composed a concerto named ‹Galimathias musicum.› After several months of travel the family returned to Salzburg in November. Here they remained till September 1767, Wolfgang devoting himself to study and composition. He composed a part of a sacred cantata for the archbishop of Salzburg, a Passion-cantata, his first concertos for the piano, and a Latin comedy, ‹Apollo et Hyacinthus.› In September he was again in Vienna, his father being attracted there by the approaching betrothal of the Archduchess Josepha to King Ferdinand of Naples. Here much jealousy and intrigue was displayed, and although Mozart composed an opera, ‹La Finta Simplice,› at the request of the emperor, it was not given a performance. Mozart, however, had the satisfaction of producing privately his operetta entitled ‹Bastien und Bastienne.› He also composed an offertorium and a trumpet concerto to be used at the consecration of a new church at the Waisenhaus.

After the return of the family to Salzburg Mozart was in 1769 appointed concertmeister, and a performance of ‹La Finta Simplice› was then arranged. He next composed two masses, and the Johannes Offertorium for a priest in the monastery at Seeon. Preparations were now made for a tour of Italy, the family arriving at Milan at the end of January 1770. While in Rome he visited the Sistine Chapel to hear Allegri's ‹Miserere.› On his return he wrote down the entire work from memory, a feat which did much to spread his fame abroad. They next visited Naples where his concerts were brilliantly attended. In Bologna he was honored by election to the ‹Accademia dei Filarmonici,› his test piece being an antiphon for four voices, which he composed in about half an hour.

His first opera ‹Mitridate Rè di Ponto› was composed and produced in Milan, where it was performed 20 times. In Padua, on his way home, Mozart was commissioned to compose an oratorio, perhaps ‹Betulia Liberata,› which was first performed in Lent, 1772. His stay at home was brief, for his friend Count Firmian, who had met him when in Milan, commissioned him to write a dramatic serenata to celebrate the nuptials of Archduke Ferdinand with Princess Maria of Modena. On 17 Oct. 1771, the performance of ‹Ascanio in Alba› was given with very gratifying results. The next month saw Mozart in Milan again and hard at work on his opera ‹Lucio Silla,› which was at length produced at the Milan opera house with great success. On reaching home Mozart composed four symphonies, three divertimenti for a wind orchestra, a grand concerto for two violins and a mass, and in the following year two masses, a grand litany, two vesper psalms, an offertorium, a bassoon-concerto, four symphonies, two serenatas, etc. The next visit was to Munich where young Mozart was engaged to compose an opera for the carnival of 1775, and on 13 January ‹La Finta Giardiniera› was produced. From that time to September 1777 Mozart, now a young man of 21, devoted himself to composing and the list of his pieces is very extensive. Later in the year he visited Mannheim with his mother, and while there had his first love affair, the young lady being Aloysia, second daughter of Fridolin Weber, a prompter and copyist. His father, on hearing of it, ordered them away to Paris, where they arrived in March 1778. Here he composed several pieces, including a gavotte, a quartette for flute and strings, and some parts of a ‹Miserere,› which were produced without even the mention of his name. On 3 July of this year his mother died. Again we find him in Salsburg in mid-June 1779, during which year he wrote the music to Gebler's drama ‹Kònig Thamos,› the operetta ‹Zaïdé,› several sonatas dedicated to the Electress of Bavaria, an aria for Aloysia Weber, whose love for Mozart had, however, grown cold, and a number of minor pieces, for which he had received commissions. His first great opportunity came in 1780 when he received orders to furnish an opera for the Munich carnival. It was entitled ‹Idomeneo, Rè di Creta,› and had its first performance on 29 Jan. 1781. Mozart now received a summons to Vienna from the archbishop, who, however, seems to have treated him as a menial. Finally severing his official relations, he took lodgings with the Webers. During the summer he wrote an opera for the National Singspiel (German) founded by the emperor in 1778, and in spite of many obstacles ‹Entführung aus dem Seraï› was produced by the emperor's express order on 16 July 1782. A month later he made Constance Weber his wife.

Mozart's marriage seems to have brought with it a succession of difficulties. Constance was a poor manager and Mozart was as yet without any fixed appointment. He gave a series of subscription concerts which were well attended, and during six weeks played at 17 concerts besides five of his own arranging. In July 1783 he took his wife to Salsburg to present her to his father, and in August produced a mass in the Peters Kirche, which he had composed in honor of his wife, who sang the soprano part on that occasion. During the latter part of 1785 Mozart was engaged on one of his masterpieces, an opera based on Beaumarchais' comedy entitled ‘Le Mariage de Figaro.’ The first public performance of the opera (‘Le Nozze de Figaro’) took place on 1 May 1786, and the triumph of the composer was complete. In 1785 Mozart wrote ‘Davidde Penitente’ for the Society of Musicians and some music for the vaudeville piece ‘Der Schauspiel-Direktor’ was also produced. In 1787 Mozart and his wife visited Prague in response to an invitation from Count Thun. Here it was decided that he should compose another opera, which he did for the small sum of 100 ducats. ‘Don Giovanni’ was the result and its first performance was given on 29 Oct. 1787. Returning to Vienna in November, he was appointed Kammer-compositor with a salary of 800 gulden.

The year 1788 was a very busy one for Mozart. In six weeks he wrote his three last and finest symphonies (in C, E flat and G minor), as well as several pieces for the piano, arranged five fugues from Bach's ‘Wohl-temperirte Clavier’ for string quartette, and added wind parts to Handel's ‘Acis and Galatea,’ ‘Messiah,’ ‘Ode to St. Cecilia's Day’ and ‘Alexander's Feast.’ In 1789 Mozart was offered the post of kapellmeister at the Prussian court. The salary was 3,000 thalers, but in spite of the comforts which this comparatively large income would have insured, Mozart declined rather than forsake his «good Kaiser.» Arriving in Vienna on 4 June, and being in much trouble, partly on account of his wife's constant illness, he informed the emperor of the offer of the King of Prussia, and tendered his resignation. The emperor exclaimed: «What, Mozart, are you going to leave me?» Mozart replied, «Majesty, I throw myself upon your kindness — I remain.» The emperor then ordered him to compose a new opera, which under the title ‘Cosi fan tutte,’ was produced on 26 Jan. 1790.

During the last year of Mozart's life, as already stated, he composed three of his greatest works, two of which must be always reckoned among the highest of musical creations, namely, the opera ‘Die Zauberflöte’ and the ‘Requiem,’ which latter he was commissioned to compose under very mysterious circumstances. Mozart's health had now become much impaired and he was greatly depressed. He believed that he was writing this ‘Requiem’ for himself. The third notable composition of this year was the opera ‘La Clemenza di Tito,’ composed for the coronation of Leopold II at Prague, which took place 6 September, the opera being performed on the same evening. His recent exertions and excitement proved too much, however, for his remaining strength, and on 5 Dec. 1791, he died of malignant typhus fever. He was buried in a pauper's grave in the churchyard of Saint Marx.

Bibliography.— Criticism: Dent, E. J., ‘Mozart's Operas: A Critical Study’ (London 1913); Hirsch, Paul, ‘Katalog einer Mozart-Bibliothek’ (Vienna 1906); Köchel, Ludwig von, ‘Chronologisch-thematisches Verzeichniss sämmtlicher Tonwerke W. A. Mozarts’ (Leipzig 1862; revised and corrected by Paul, Graf Waldersee, ib. 1905); Komorzynski, E. von, ‘Mozarts Kunst der Instrumentation’ (Berlin 1906); Sachs, Curt, ‘Mozarts Briefe’ (Berlin 1911); Schiedermair, Ludwig, ‘Die Briefe Mozarts und seiner Familie’ (2 vols., Munich 1914); Storck, Karl, ‘Mozarts Briefe in Auswahl’ (Stuttgart 1906); Lady Wallace (translator), ‘Mozart's Letters 1769–91’ (London 1865). Biography: Bellaigue, Camille, ‘Mozart’ (Paris 1906); Beyle, ‘Vies de Haydn, de Mozart et de Metastese par de Stendhal’ (1887); Breaksfeare, ‘Mozart’ (London 1902); Elson, ‘Great Composers and their Work’ (1898); Gehring, F. E., ‘Mozart’ (New York 1911); Grove, ‘Dictionary of Music and Musicians’ (Vol. II, pp. 379–406, 1898); Holmes, Edward, ‘Life of Mozart, Including his Correspondence’ (New York 1912); Hubbard, ‘Little Journeys to the Homes of Great Musicians’ (Vol. I, London 1901); Jahn, Otto, ‘W. A. Mozart’ (Leipzig 1856–59; revised and enlarged by H. Deiters, 2 vols., Leipzig 1905; trans. by Pauline D. Townsend, 3 vols., London 1891); Niemtschek, ‘Leben Mozarts’ (1798); Nissen, ‘Biographie W. A. Mozarts’ (Berlin 1828); Nohl, Ludwig, ‘Mozart's Leben,’ revised by P. Sokolowsky (3d ed., Berlin 1906; Eng. trans. by Lady Wallace, 2 vols., London 1877); id., ‘Mozart nach den Schilderungen seiner Zeitgenossen’ (1880); Nottebohm, ‘Mozartiana’ (1880); Oulibischoff, ‘Mozarts Leben und Werke’ (1859); Pohl, ‘Mozart und Haydn in London’ (1867); Schurig, Arthur, ‘W. A. Mozart, sein Leben und sein Werk’ (2 vols., Leipzig 1913); Storck, Karl, ‘Mozart, sein Leben und Schaffen’ (Stuttgart 1908); Von Wurzbach, ‘Mozartbuch’ (1869); Wilder, Victor, ‘Mozart’ (2 vols., New York 1908); Wyzema and Saint-Foix, ‘W. A. Mozart, sa vie musicale et son œuvre’ (2 vols., Paris 1912).

R. I. Geare,
National Museum, Washington, D. C.

MOZART, mō'tsärt or mō'zärt, **Leopold**, German composer: b. Augsburg, Bavaria, 14 Nov. 1719; d. Salzburg, 28 May 1787. He became kapellmeister to the archbishop of Salzburg. He wrote voluminous amounts of music, and published a justly famous ‘Violin School’ (1756), the first theoretical and practical guide to that instrument and long the only one. It passed into numerous editions. He was the father of Wolfgang Amadeus Mozart (q.v.).

MOZDOK, mŏz-dŏk', Russia, town in the province of Terek in the government of the Caucasus, located on the left bank of the river Terek. Its manufactures are candles, soap, leather, tiles, brandy, etc., and it has a good trade in coarse woolen and cotton goods, sheep, horses, silks, etc. In the neighborhood are vineyards, silk-growers, vegetable gardens, etc. It holds agricultural markets twice yearly, with a considerable cattle exchange. In 1911 it had a population of 17,068, made up of Kabardines, Tchetchens, Georgians, Armenians, etc., besides Russians.

MOZIER, mō'zhĕr, **Joseph**, American sculptor: b. Burlington, Vt., 1812; d. Faids, Switzerland, 1870. He was a merchant in New York from 1831 till 1845, when he retired and went to Rome to open a studio to practice as sculptor. He produced quite a number of figures, the best known being ‘Pocahontas,’ ‘The Wept of Wish-ton Wish,’ ‘Rizpah,’ in

Metropolitan Museum; ‹Rebecca at the Well,› ‹Jepthah's Daughter,› ‹Undine,› ‹Queen Esther,› ‹Truth,› ‹Silence,› ‹The Prodigal Son,› etc. The latter, his most ambitious work, is in the Pennsylvania Academy of Fine Arts, and his ‹Il Penseroso› is in Horticultural Hall, Fairmount Park, Philadelphia.

MOZLEY, James Bowling, English clergyman: b. Gainsborough, Lincolnshire, 15 Sept. 1813; d. 1878. He was educated at Grantham and was graduated (1838) at Oriel College, where he became a close acquaintance of Newman, Pusey, Froude, etc. He participated in the «Oxford Movement,» but could not accept the Roman communion and some other features. He was elected (1840) a Fellow of Magdalen and became joint editor of the *Christian Remembrancer*, resigning in disagreement with the Gorham decision. He was one of the *Guardian's* first adherents and became vicar of Shoreham in 1856. In 1869 he was made canon of Worcester and was created regius professor of divinity at Oxford in 1871. He wrote ‹A Treatise on the Augustinian Doctrine of Predestination› (1855); ‹The Primitive Doctrine of Baptismal Regeneration› (1856); ‹A Review of the Baptismal Controversy› (1862): ‹Lectures on Miracles› (1865), the Bampton Lectures. His ‹Essays, Historical and Theological› (1878), were published in two volumes, and his sister's biographical comment in the preface.

MOZOOMDAR, mō-zoom'där, **Pratap Chandra,** Hindu reformer: b. Calcutta, India, about 1840; d. 1905. He joined the association of the Brahmo-Somaj (q.v.) organized for the purification of Brahmanism, and edited at Calcutta the *Theistic Quarterly Review* and *The Interpreter*, published by that organization. In 1874 he visited England and in 1883 the United States, being received with honor by leading men of both nations. In 1893 he made a second visit to the United States to attend the World's Parliament of Religions, before which he read a paper on the Brahmo-Somaj. He wrote ‹The Faith and Progress of the Brahmo-Somaj› (1882); ‹The Oriental Christ› (1883); ‹Life and Teachings of Keshub Chunder Sen› (1887), and articles for English and American periodicals. His influence in India was never great despite his great acclaim outside his native land.

MOZYR, mō-zēr, Russia, a town in the government of Minsk, on the Pripet River and on the Brjansk-Brest Railway. It has three orthodox and one Roman Catholic Church, also a synagogue. It has suffered much from depredations of the Tartars and was consumed by fire in 1609 and 1864. It has manufactures of hardware and leather and considerable trade in lumber and cattle. Pop. 10,729.

MR. MIDSHIPMAN EASY, published in 1836, is probably the best known of the many sea novels by Capt. Frederick Marryat. This spirited and entertaining story deals with the life of John, otherwise known as Jack Easy, from the time of his birth to his settlement in life by marriage and inheritance of an important estate. A youth of fine qualities, he is spoiled at home by his mother and educated in ideas of equality by his father. Much against their will he is sent to sea as midshipman at an early age and at the end of four years returns quite cured of odd ideas and with a fine record for bravery. His exciting and humorous adventures in the service of the royal navy make up the bulk of the book, which gives a lively picture of sea actions and a sailor's life on shore and on board ship. The galaxy of characters, part serious, part comic — Captain Wilson, Sawbridge, Mesty, Biggs, Oxbelly and many others — is an especially good one. The deeper purpose of the novel is to show the more humane and chivalrous side of naval warfare and to set forth the finer traditions of the service.

William T. Brewster.

MUCH ADO ABOUT NOTHING. ‹Much Ado about Nothing› is first mentioned in August 1600 and was printed in the same year. It is not referred to in Meres's famous list of Shakespeare's plays in 1598, unless indeed it is to be identified with the mysterious comedy, ‹Love's Labour's Won,› which Meres includes among Shakespeare's works. That ‹Much Ado,› in some less finished form than we now have, had been staged as early as 1598 under the title of ‹Love's Labour's Won,› is a bare possibility which hardly warrants speculation, but there is this to be said in its favor: it occupies among the comedies of Shakespeare's full maturity a position very analogous to that which Love's Labour's Lost,› has among the early comedies. Each of these plays, when compared with others of the same period (with ‹The Two Gentlemen of Verona› and ‹A Midsummer Night's Dream› or with ‹As You Like It,› ‹Twelfth Night,› and ‹All's Well that Ends Well›) impresses the reader as a drama of the intellect rather than of the heart. Intrigue and wit overbalance romance in both, and personal planning largely takes the place of delectable chance. Benedick and Beatrice are finished studies which seem to have developed out of the sketches of Biron and Rosaline in ‹Love's Labour's Lost.› It goes with what has been said that this is a play of prose rather than poetry, of epigram rather than sentiment. Only a quarter of the lines are in verse, and this verse is seldom notable. The unfailing charm of the comedy lies in the infinitely brilliant superficiality of Beatrice and Benedick, the two arch-enemies of romance — in the unemotional cut and thrust of their badinage; and, next, in the ludicrous realism of the constables, Dogberry and Verges. All testimonies agree that this comedy is one of Shakespeare's most complete successes. It is also a remarkable evidence of the author's versatility, for it proves that he could execute with unsurpassed spirit and skill a type of play for which his other greater works would indicate that he had little natural inclination. ‹Much Ado about Nothing› is the only one of Shakespeare's major dramas which one can imagine that Congreve or Sheridan might have written. On the stage it has always been triumphant. When compared with its special corrivals among Shakespeare's comedies — the more romantic ‹As You Like It› and ‹Twelfth Night› — it impresses one as suited rather more to the theatre and rather less to the study. About a quarter-century after the poet's death, it was selected by

Leonard Digges among the special examples of Shakespeare's drawing power:

> "Let but Beatrice
> And Benedick be seen, lo, in a trice
> The Cockpit, Galleries, Boxes, all are full." (1640)

David Garrick was a famous Benedick, and nearly all the greatest actresses have found opportunities for added laurels in Beatrice. The source of this play is relatively unimportant, for the greatest parts of it — the clownery of the constables and the figures of Beatrice and Benedick — seem to have sprung spontaneously from Shakespeare's brain. That part of the plot, however, which concerns Hero, Claudio and Don John is paralleled in several earlier works, in Spenser's 'Faerie Queene' (Bk. IV, ii), in Ariosto's 'Orlando Furioso' (Bk. V), and particularly in the 20th tale of Bandello's Italian *novelle* (printed 1554). It appears to have been from the last (possibly in the French or in some now unknown English version) that Shakespeare drew his hints; but the dramatist, besides altering the material in details, so subordinates it to the newer themes that it is likely to impress modern taste as either repellent or uninteresting.

TUCKER BROOKE.

MUCIC ACID, $C_6H_{10}O_8$, an organic acid formed by oxidizing milk sugar, or galactose, gum arabic and certain other substances, by the action of dilute nitric acid. It crystallizes in colorless tablets which are insoluble in alcohol, slightly soluble in cold water, and rather freely soluble in boiling water; though when boiled with water it becomes converted into an isomeric substance known as «paramucic acid.» Mucic acid melts at about 410° F., does not reduce Fehling's solution, and combines with ammonia and with metallic and organic bases to form an extensive series of salts.

MUCILAGE, a solution of gum in water, In chemistry, the gum of seeds and roots. The name is also given to commercial adhesive gum made from gum arabic or dextrin. Mucilages, in pharmacy, are water preparations of substances dissolved in water, used to suspend insoluble ingredients or to bind them together in a mass.

MUCIN, an albuminous proteid substance, which is an important constituent of the connective tissue of the animal body, and which gives to the mucous membranes their characteristic sliminess. It may be isolated by extraction with lime water (or with pure water), and subsequent precipitation with acetic acid, in excess of which mucin is insoluble. Mucin is not precipitated by heat nor by tannic acid. It is, however, precipitated by alcohol, or by saturating its solution with common salt, or with magnesium sulphate. When boiled with strong sulphuric acid, mucin yields leucine and tyrosine.

MUCIUS SCÆVOLA. See SCÆVOLA.

MUCKER, nickname of certain mystic fanatics who were thus popularly derided as «canting hypocrites.» The adjective is of ancient origin and did not connote a specific sect until it was applied to the followers of Johann Heinrich Schönherr and later Johann Wilhelm Ebel in Königsberg. Schönherr, who was the son of a Prussian non-commissioned officer, and was educated under the theological faculty of the University of Königsberg, combined odd ends of the Kantian philosophy with gleanings from the Bible into a dualistic neo-Gnosticism. Ebel, a Lutheran pastor, was a convert of his, and in 1826 was joined by Johann Diestel, another pastor. The doctrine, which involved peculiar views as to the sexual relations, spread among fashionable circles in Königsberg. In 1835 Count Finckenstein, a former convert, accused Ebel and Diestel of immorality. They were unfrocked, but were not convicted of actual immorality. Consult Mombert, J. I., 'Faith Victorious' (New York 1882); Dixon, W. H., 'Spiritual Wives' (London 1868). See EBELIANS.

MUCORACEÆ, the molds. See FUNGI.

MUCOUS MEMBRANE. The mucous membranes line passages and cavities which communicate with the exterior of the body, where they become continuous with the skin. They constitute the lining of the alimentary canal or tract, which begins at the mouth and ends at the anus, a distance of about 27 feet, and is the passage through which the food for nutrition of the body is introduced, digested and taken up for the preservation and health of the body. They also form the lining of the nose, the throat, the middle ear, the various sinuses communicating with these cavities, the eyes, and of the respiratory apparatus, which comprises the lungs, the windpipe or trachea, and the larynx. The kidneys, the ureter, the bladder, the testes and the urethra in the male, and the Fallopian tubes, womb, vagina and vulva of the female are all lined with mucous membrane, together with the membrane of the ducts of glands which open upon it. In the female it becomes continuous with the peritoneum at the fimbriæ of the Fallopian tubes. The surface of the mucous membranes of the body is subjected to the contact of various matters, such as the food, the air, and the different glandular secretions and excretions. They are protected from undue irritation by a viscid liquid called mucus (q.v.), which constantly bathes their surface, and are also well supplied with blood-vessels and nerves. The mucous membranes are not of a single origin, but may be derived from ectsderm, as is the case with the lining of the mouth, entoderm, as with the greater part of the digestive tract, or mesothelium, as in the urogenital ducts. A mucous membrane consists of an epithelium, or layer of lining cells; a connective-tissue basement-membrane, which may be hyaline and apparently homogeneous; and a further connective-tissue support or *tunica propria*. It usually is invaginated into glands, and may be evaginated into villae, as in the case of the stomach and intestine. For the diseases of the mucous membrane, see the respective organs or systems concerned.

MUCUS, a semi-fluid substance, of a viscid, tenacious character, produced by the various mucous membranes of animals, and found covering the exposed surface of such membranes. Thus it is produced in the mucous membrane lining the nose, the mouth and throat, the gullet, stomach, large and small bowel, the air-tubes of the lungs, the kidneys, ureter, and bladder, the gall-bladder, the ducts of glands, the bile-ducts, etc. In all these situations it serves to lubricate the membrane over the surface of which it is spread, and to protect the delicate surface from the action of irritating agents. Its viscid character prevents it being readily removed, and thus enables it more effectually to discharge its protective function. It is to be noticed that many of the mucous membranes have special glandular structures embedded in them, which produce special secretions, not mucus, such as the mucous membrane of the stomach and bowels, whose secretions have special properties connected with the digestion of the food. The saliva from the mouth is a mixture of mucus and the special secretion from the salivary glands, which acts on the starchy elements of food. Other mucous membranes have no such special structures, and only mucus is secreted by them, such as the mucous membrane of the nasal passages. Mucus is secreted by glands situated deep in the mucous membrane, and such glands are found in the mucous membrane of the nose; similar glands of very minute form are found scattered thickly in the mucous membrane of the mouth, and are found of considerable size in the back part of the tongue, in the gullet, and other situations. But mucus is also produced by single epithelial cells, lining mucous membranes. The form of epithelial cell called the «goblet cell» is believed to be a mucous-secreting cell, and it is found in large numbers lining the mucous membrane of the air-passages, the stomach and bowels. So that by their agency the special digestive secretions of stomach and intestines contain a large admixture of mucous material. Pure mucus is transparent, but it is usually turbid from the presence of foreign materials, and epithelial cells from the secreting membrane. Its chief ingredient is mucin, a derivative from albuminous bodies, consisting of carbon, hydrogen, oxygen and nitrogen, but, unlike albumin, containing no sulphur. It is held in suspension by water, forming an opaque liquid, but is not dissolved by it. Besides mucin, mucus contains small quantities of proteid substances and salts, chiefly common salt. Water constitutes nearly 94 per cent of its bulk. From fluids containing it in suspension, such as bile, it may be precipitated in a flocculent stringy mass by alcohol. Heat does not coagulate it; and it is dissolved by weak solutions of alkalies and alkaline earths.

MUD (or PEAT) BATH, in which the body is immersed in mud or peat. At Eger, Bohemia, black mud is heated to a temperature of 100°. It contains sulphate of soda, iron, lime, alumina and ulmic acid. The body is immersed for 15 minutes, after which the patient goes into water to remove the mud. Such a bath may be of use in chronic skin diseases, rheumatism, gout, etc.

MUD-BUFFALO, a name, in the leather trade, for the Indian buffalo (*Bos bubalus*) as found in a wild or semi-wild condition in the Malay Peninsula, where they frequent swamps and are shot for the sake of their hides. These hides are not tanned, but are sent green to India, Europe and America to be used in the making of loom-pickers, mallets, gears and other tools used in cotton-milling. They become harder than wood, and are tougher and more elastic.

MUD-CAT. See CATFISH.

MUD CRACKS, cracks formed in mud surfaces by shrinkage due to drying. The surface of the mud flat is usually broken up into polygonal blocks, by cracks varying from a few inches to several feet in depth. These are also known as sun cracks, and are commonly formed in the muds of flood plains and deltas, and on playa (q.v.) surfaces. They are often filled with drifting sand and preserved in the sediment as the rock solidifies. For a discussion of their geological significance, see the section on *Structure,* in the article on GEOLOGY.

MUD-EEL, the amphibian *Siren lacertina,* which has persistent gills but no hind legs. It resembles the Proteidæ (q.v.) in many ways. See SIRENIDÆ.

MUD-FISH, the name of various fishes found in muddy water, or fond of burrowing in the ooze of swamps. The Nile bichir and its relatives, the reed-fishes of the sluggish African rivers, are so called; also the lepidosiren and other dipnoans, which grovel on muddy bottoms. In the United States, the name belongs to some small mud-minnows (q.v.), and to a curious fish (*Amia calva*) of the Mississippi Valley, known as dogfish, bowfin and by various other names. This, like the bichir and the reed-fish, is a ganoid (q.v.). It is a rather shapeless, dark-colored, exceedingly hardy fish, reaching a length of two feet and a dozen pounds in weight. It is carnivorous, feeding voraciously upon crayfish, small mollusks and anything it is able to seize and swallow; and it greedily seizes a baited hook and then fights gamely for its life, so that it is a favorite with anglers, though hardly fit to eat.

MUD-HEN, or MARSH-HEN, a sportsman's name for any of several rails, gallinules, coots and similar birds which make their home in marshes; it is most often given in the North to the Gallinule (*Gallinula galeata*), a bird of the rail family, much like the British water-hen (*G. chloropus*), and common in the marshes about the Great Lakes and Mississippi Valley, where its cluckings resound in summer from every reedy marsh. It is about a foot in length, olive-brown on the back, dull black on the under parts and with a red bill. It is migratory; but the Southern States have a smaller and more handsome mud-hen in the resident purple gallinule (*Ionornis martinica*).

MUD-MINNOW, or DOGFISH, one of the smaller fresh-water carnivorous fishes of the pike family, the *Esocidae* and the genus *Umbra* related to the Alaskan blackfish (*Dallia*). It lives in muddy bayous, and among weeds at the bottom of clear but sluggish streams, often burrowing in loose mud. There are two North American species: *Umbra limi* of the interior, and *U. pygmæa* of the eastern coast; and one in Austria. Such a distribution increases the probability that this is of «an archaic type, characteristic of some earlier fish-fauna.» The mud-minnows reach a length of about four inches and are valued as live bait, since they will long endure with vigor impalement on the hook.

MUD-PUPPY, or WATER-DOG, a member of the *Proteidæ* (q.v.). In this country usually *Necturus maculatus,* a large newt common in the eastern Mississippi Basin. For its development and metamorphoses, see EMBRYOLOGY.

MUD-SHAD (*Dorosoma cepedianum*), the hickory or gizzard shad. This fish grows to a length of about 15 inches, is silvery blue in color, and occurs throughout the Mississippi Valley and in great abundance from Cape Cod to Mexico.

MUD-SKIPPER, a minute tropical fish of the goby family and genus *Periophthalmus*, which is accustomed to go ashore and skip about the space between tide-marks, exploring the rocks, roots of trees, etc., for food, and skipping about like grasshoppers. Some curious qualities distinguish these little creatures, which are found from West Africa to Japan, and make them highly interesting to naturalists. Consult Day's 'Fishes of India' (1878) and other works on the natural history of the Eastern seas.

MUD-TURTLE, or MUD-TORTOISE, any fresh-water turtle usually found in muddy places. In the United States, the ordinary mud-turtle is *Cinosternon pennsylvanicum*, which has a grayish-brown smooth shell, and a dark-colored head, with light dots. See BOX-TURTLE.

MUD-WASP, one of the many kinds of solitary wasps which fabricate out of wet clay cell-like receptacles, variously shaped and placed, in which to store their eggs and the provision for the larvæ. See WASP.

MUDDOCK, Joyce Emmerson, English journalist and author: b. Southampton, England, 28 May 1843. He has been connected with several London journals and beside publishing some 52 volumes under the *nom de guerre* of «DICK DONOVAN» is the author of many other works, among which are 'Basile the Jester'; 'The Great White Hand'; 'Fair Rosalind,' and 'Pages from an Adventurous Life.'

MUDGE, Enoch, American Methodist clergyman: b. Lynn, Mass., 28 June 1776; d. 2 April 1850; the first Methodist clergyman reared in New England. He became an itinerant clergyman of the Methodist Church in 1793, and in 1793–99 traveled on his duties about Maine until hardships affected his health, and he was settled at Orrington (1799–1816). During this period he was twice elected to the legislature, where he obtained the repeal of a law imposing a tax on other denominations for the benefit of the Congregationalists. Having resumed itineracy in 1816, he was stationed at Boston, Lynn, Portsmouth, Newport and other places. From 1832 until his retirement from active life in 1844, he was pastor of the Seamen's Chapel at New Bedford. He was a member of the Massachusetts Constitutional Convention in 1819. He contributed much to the press, and published in bookform 'Camp-Meeting Hymn-Book' (1818); 'Notes on the Parables' (1828); 'Lynn,' in verse (1830), and 'Lectures to Seamen' (1836).

MUDIR, moo-dēr', the title of a Turkish or Egyptian official; the governor of a province.

MUEZZIN, mū-ĕz'in, in Mohammedan countries the beadle of the mosque, whose duty it is to summon the faithful to prayer at the assigned periods by public proclamation from the minaret (q.v.). His call is the *azan*, and is sounded five times each day. The call is «God is most great [four times]! I bear witness that there is no god but one God [twice]! I bear witness Mohammed is the apostle of God [twice]! Come to prayer [twice]! Come to salvation [twice]! God is most great [twice]! There is no god but God [twice]!» In the morning call the words «Come to salvation!» «Prayer is better than sleep!» are repeated twice.

MUFTI, the title of a high Turkish official: who assists the judge or cadi by interpreting the law of the Koran, of Moslem tradition and of other legal sources. The Grand Mufti or Sheikh-ul-Islam (see SHEIK) is one of the interpreters of the Koran, by whose decisions the cadis have to judge. The phrase, «in mufti» meaning, «not in uniform; in civilian dress,» is an Anglo-Indian expression, referring to the loose robes of the Moslem mufti.

MUGGER. See MARSH-CROCODILE.

MUGGLETONIANS, a religious sect founded (1610) by Lodowicke Muggleton in London. He claimed that he and his cousin John Reeve, a tailor like himself, were the two witnesses who should «prophesy a thousand two hundred and three score days, clothed in sackcloth» (Rev. xi, 3). He was 40 years old when he received this commission through visions and mysterious voices. 'The Divine Looking Glass' (1656) contains an exposition of the teachings of the Muggletonians who deny the doctrine of the Trinity and believe in a material God, who suffered on the cross. Penn's 'The New Witnesses proved old Heretics' (1672) was a reply to the attacks of Muggleton. This Muggletonian bible was republished 1846 by a few remaining adherents of the sect. Consult Jessopp, A., 'The Coming of the Friars' (1888).

MUGWORT, an ornamental and culinary herb. See ARTEMISIA.

MUGWUMP, *in American politics*, a term originating during the Presidential campaign of 1884 between Grover Cleveland and James G. Blaine. It was applied by a New York newspaper to such members of the Republican party as refused to support their party nominee, James G. Blaine, and advocated the election of Grover Cleveland in the interest, they claimed, of civil service reform. The word belongs to the Algonquin dialect of the Indian languages and is used by John Eliot in his translation of the Bible to translate the Hebrew word *Alluph*, a «leader.» Eliot used it in the sense of «big chief,» a term more comprehensible to the Indian mind than that which appears in the King James' version—«duke.» The word was spelled «Mugquomp» in the singular, and «Mugquompaog» in the plural. It appears in many places throughout the Algonquin translation of the Old Testament.

MUHARRAM, (Ar. *muharram*, sacred, from *horama*, to forbid), moo-hăr'am, the first month in the Mohammedan year. The tenth day is known as the day of Ashura, and was originally made by Mohammed the great fast of the year, in imitation of the Jewish Day of Atonement, which is celebrated on the tenth day after New Year's Day. Later on this came to be replaced by the fast-month of Ramadan. Nowadays among the Sunnites the day of Ashura is only a voluntary fast. The Shiites mourn on this day in memory of the martyrdom of Husein (q.v.) at Kerbela.

MÜHLBACH, mül'bäн, **Luise.** See MUNDT, KLARA.

MÜHLBERG, mül'bĕrk, Prussia, town in the government circuit Merseburg, and the district Liebenwerda. It is located on the Elbe, has two Evangelical churches, court of justice, inland-revenue office, etc. Its industries consist of a sugar factory, saw-mills, brick kilns, besides commerce in lumber and grain and shipping. It is noted in history through the victory of Emperor Charles V over John Frederick, Elector of Saxony, in 1547. Pop. 3,345.

MUHLEMAN, mūl'man, **Maurice Louis,** American author: b. near Alton. Ill., 27 Nov. 1852; d. 12 June 1913. He was graduated from the law school of Columbia University in 1879 and was appointed to the United States treasury service in 1872. In 1888–1901 he was deputy assistant treasurer of the United States. He has published 'The Money of the United States' (1894); 'Monetary Systems of the World' (1896); 'Treasury System of the United States' (1907); 'Banking Systems of the World' (1908); 'A Plan for a Central Bank' (1910); 'Governmental Supervision of Banks' (1911).

MUHLENBERG, mū'lĕn-berg, **Frederick Augustus Conrad,** American Lutheran clergyman and politician; son of Heinrich Melchior Muhlenberg (q.v.): b. Trappe, Pa., 1 Jan. 1750; d. Lancaster, Pa., 4 June 1801. He was educated in Halle, Germany, and returning in 1770 was ordained to the Lutheran ministry. In 1773–76 he had charge of a Lutheran church in New York and then removed to Pennsylvania where he held several pastoral charges. He was a hearty sympathizer with the cause of the colonies and though not participating in the war aided his countrymen politically and ultimately abandoned his pastoral work for a political life. He served in the Continental Congress and was speaker of the first House of Representatives under Washington, and in 1795 his was the deciding vote which rescued the Jay treaty from defeat.

MUHLENBERG, Gotthilf Henry Ernst, American Lutheran clergyman and botanist: b. Trappe, Pa., 17 Nov. 1753; d. Lancaster, Pa., 23 May 1815. He was a brother of F. A. C. Muhlenberg and son of Heinrich Melchior Muhlenberg (qq.v.), and was educated with him in Halle, Germany. He returned to America in 1770, was ordained to the ministry and became an assistant to his father who was in charge of a Lutheran church in Philadelphia. He served in various charges until 1779 when he accepted a call to Lancaster where he remained until his death. In addition to his pastoral duties he distinguished himself as a scientist and took first rank as a botanist. He published 'Catalogus Plantarum Americæ Septentrionalis' (1813); 'Descriptio Uberior Graminium' (1817), etc.

MUHLENBERG, Heinrich Melchior, German-American clergyman, organizer of the Evangelical Lutheran Church in America: b. Eimbeck, Hanover, 6 Sept. 1711; d. New Providence (now Trappe), Montgomery County, Pa., 7 Oct. 1787. He was educated at the University of Göttingen (1735–37), studied theology there (1737–38) and at Halle (1738–39), was ordained in 1739, and from 1739 to 1741 was deacon of the church at Grosshennersdorf, Upper Lusatia. On 6 Sept. 1741 he was called as missionary to the Lutheran congregations of Pennsylvania, located at Philadelphia, New Providence (now Trappe), and New Hanover. At that time there was a large number of Lutherans in America; but they were unorganized and without pastors, and such religious meetings as they had were conducted by laymen. Muhlenberg, who arrived at Charleston, S. C., 22 Sept. 1742 and at Philadelphia, 25 November, was well qualified for the work of effecting union and order. He at once entered on the duties of his charge, and preached his first sermon in Pennsylvania in an unfinished log-building at New Hanover, 28 November. Though Muhlenberg's local pastorship was largely restricted to the three congregations which had summoned him, his activities were really those of a bishop. He traveled over a wide extent of territory, preached at Lancaster, York and other places in Pennsylvania, in New York, and also occasionally in New Jersey, Maryland and among the Salzburger Lutherans of Georgia. «There was probably,» thinks Stoever, «not a Lutheran church, in his day, in this country in which he had not officiated.» He was at first looked upon as an intruder by Zinzendorf and other Moravians, with whom he was for a time involved in conflict. But so successful was he in his labors that by 1745 there was real need for the reinforcement from Halle, consisting of the Rev. Peter Brunnholtz and the catechists Kurtz and Schaum. The first church edifice at Philadelphia, Saint Michael's, was completed in 1743, and on 25 June 1769 Zion's Church, then considered the largest and finest in the United States, was dedicated there. On 14 Aug. 1748 the first Lutheran synod in America was organized under the direction of Muhlenberg, who became its president. In 1754 Muhlenberg prepared the 'Kirchen Agende,' a directory for public worship, and in 1762 reorganized the Philadelphia congregation under a constitution which became the basis of that of most congregations later established. He identified himself with the American cause in the Revolution, and was in consequence subjected to many annoyances, particularly when Pennsylvania was the scene of war (1777–78). He was a linguist of high rank, versed in Hebrew, Greek and Latin (in which he made an address at the synod of 1750), and proficient in English, Dutch, French, Bohemian and Swedish. His large foreign correspondence appeared at Halle in 1787. Consult 'Die erlaubte Klage über den Abschied treuer Knechte Gottes' (1788), a memorial sermon by J. H. C. Helmuth (with biographical sketch); Stoever, 'Memoir of the Life and Times of Muhlenberg' (1856); Mann, 'Life and Times' (1887), considered the best.

MUHLENBERG, John Peter Gabriel, American patriot: b. Trappe (then New Providence), Montgomery County, Pa., 1 Oct. 1746; d. near Philadelphia, 1 Oct. 1807. He was the son of H. M. Muhlenberg (q.v.), the founder of the German Lutheran Church in America. He was educated for the ministry, was for a time pastor of German Lutheran churches at New Germantown, N. J., and Bedminster, N. J. In 1772 he went to Woodstock, Va., and finding that in order to enforce the payment of tithes he must be ordained in the Episcopal Church, he was ordained priest in England. He was chairman of the Shenandoah County committee of safety, and 1774 a member of the Virginia house of burgesses. At Washington's request he became a colonel in the Continental army. His last sermon was upon the duties men owe their country; and saying, «There is a time for all things — a time to preach and a time to fight — and now is the time to fight,» he stripped off his gown after the service, appeared in full uniform, called for recruits and enrolled about 300 of the parishioners. He participated in several battles, was made brigadier-general in 1777, and major-general at the close of the Revolution. After the war he removed to Pennsylvania, where he was elected a member of the supreme executive council, and in 1785 bcame its vice-president. He served as representative in Congress from 1789 to 1795, and from 1799 to 1801. In 1801 he was elected United States senator, but soon resigned and was appointed supervisor of the revenue for the district of Pennsylvania. From 1803 till his death he held the office of collector of the port of Philadelphia. Consult Muhlenberg (H. A.), ‹Life› (1849).

MUHLENBERG, William Augustus, American clergyman: b. Philadelphia, 16 Sept. 1796; d. New York, 8 April 1877. He was graduated (1814) at the University of Pennsylvania and was ordained deacon (1817) of the Episcopal church and priest three years later, becoming assistant to the rector, Bishop White, of Saint Peters and Saint James parishes. In 1821 he went to Lancaster, Pa., becoming rector of Saint James Church and established there the first public school in the State outside of Philadelphia. He went to Flushing, L. I. (1828), and founded a Christian high school (later Saint Paul's College), he remaining principal till 1846, when he was appointed rector of the church of the Holy Communion, New York City, erected by his sister. He started collecting a fund for the erection of a church hospital out of which Saint Luke's Hospital was built (1858) on 54th street between Fifth and Sixth avenues and he became its first pastor and superintendent, which positions he held till his death. His last very useful work was in founding Saint Johnland Christian industrial community on the north shore of Long Island. In 1843 he organized the first Protestant sisterhood in the United States. He wrote several well-known hymns including ‹I Would Not Live Alway›: ‹Like Noah's Weary Dove›; ‹Shout the Glad Tidings.› His chief works published are ‹Evangelical Catholic Papers› (1875–77, 2 vols.); ‹Christian Education› (1831). Consult Ayres, Sister Anne, ‹Life and Work of William Augustus Muhlenberg› (1880).

MUHLENBERG COLLEGE, in Allentown, Pa.; founded in 1867 under the auspices of the Lutheran Church. In 1915 there were connected with the college 16 professors and instructors, and about 354 pupils. There were in the library 20,741 volumes. The courses of study lead to the degrees of A.B., B.S. and Ph.B.

MÜHLHAUSEN, mül'how-zĕn, France, a town of Alsace-Lorraine. See Mülhausen.

MÜHLHAUSEN, Prussia, town of Saxony, in a fertile district on the Unstrut, 29 miles northwest of Erfurt. It has two interesting old churches, an old town-house, a gymnasium, various technical, commercial and other schools, hospitals, an orphanage, etc. It manufactures woolen and cotton or mixed goods, hosiery, cigars. leather, cycles, sewing-machines, wooden wares, furniture; and carries on tanning, dyeing, malting, brewing, etc. The Anabaptist Münzer, a leader in the Peasants' War, had his headquarters here, and was executed near by in 1525. The town became part of the Kingdom of Prussia in 1815.

MUHLHEIM, mül'hīm. See Mülheim.

MUIR, mūr, **John,** Scottish Sanskrit scholar: b. Glasgow, 5 Feb. 1810; d. Edinburgh, 7 March 1882. He was educated at Glasgow University and at Haileybury College, whence he passed into the Bengal Civil Service in 1828. He remained in India 25 years, filling various offices in the revenue, educational and judicial departments. His fame will rest on his ‹Original Sanskrit Texts on the Origin and History of the People of India, their Religion and Institutions,› illustrated (1858–70). The first volume discusses the legendary accounts of the origin of caste; the second, the primitive homes of the Hindu; the third, the opinions of Hindu writers on the Vedas; the fourth, the contrast between Vedic and later Hindu theology; and the last the cosmological and mythological conceptions of the Indians in the Vedic age. In 1862 he founded a chair of Sanskrit and comparative philology in the University of Edinburgh, following out the plans of the Association for the Better Endowment of Edinburgh University, of which he was the main originator.

MUIR, John, American naturalist and explorer: b. Dunbar, Scotland, 21 April 1838; d. Los Angeles, 24 December 1914. He came to America in 1849 with his father, who settled near Fox River, Wis.; entered the University of Wisconsin when 22; and after a special course of four years commenced his lonely journeys through Canada, Eastern and Western United States, the West, and the South, that made him a botanist and a geologist. In 1868 after visiting the Yosemite Valley, he made it his main central camp for 10 years while studying the forests, glaciers, etc., of the Sierra Nevada. He discovered in the High Sierra 65 residual glaciers. He made his first trip to Alaska in 1879, discovered Glacier Bay, and Muir Glacier, named after him, and explored some of the upper courses of the Yukon and Mackenzie rivers; in 1880 accompanied the DeLong search expedition to the Arctic, and in 1903–04 traveled in the Caucasus, Siberia, Manchuria, Japan, India, Egypt, Australia and New Zealand. He has written much for newspapers and periodicals, urging the formation of national parks — both the Sequoia and Yosemite are in great part due to his efforts — and has published ‹The Mountains of California› (1894), and ‹Our National Parks› (1901). He was a member of the American Academy of Arts and Letters, and received honorary degrees at Yale and the universities of Wisconsin and California. Among his works are ‹Stickeen› (1909); ‹My First Summer in the Sierra› (1911); ‹The Yosemite› (1912); ‹Story of my Boyhood and Youth› (1913); and the posthumous ‹Letters to a Friend› and ‹Unpublished Prose and Letters› (1915).

MUIR, Sir **William,** Scottish administrator and Arabic scholar: b. Glasgow, 1819; d. 11 July 1905. He attended lectures at the universities of Edinburgh and Glasgow and at 18 entered the Bengal civil service, where he attained distinction. He became secretary of the government of the Northwest provinces and member of the Revenue Board, and during the mutiny was in charge of the Intelligence Department at Agra. He was lieutenant-governor of the Northwest provinces 1868–74, and financial minister to the government of India 1874–76. Returning to England he sat on the Council of India, 1876–85, was elected principal of the University of Edinburgh, 1885–1900. He has published ‹Life of Mahomet› (1858–61; abridged ed. 1877); ‹Annals of the Early Caliphate› (1883); ‹The Coran, Its Composition and Teachings, and the Testimony it Bears to the Holy Scriptures› (1877); ‹Extracts from the Koran› (1880); ‹The Early Caliphate and Rise of Islam› (1881); ‹The Mohammedan Controversy› (1897).

MUKDEN, mook'dĕn, **MOUKDEN,** or **FUNG-TIEN-FU,** capital of Manchuria and of the province of Shinking, situated on the Hun, a tributary of the Liau River, about 500 miles northeast of Peking. Its port is Newchwang, about 120 miles distant, near the Gulf of Liao-Tong. It is the cradle of the Manchu race, and until recently was known by its old Chinese name of Sin-Yang, its Manchu name of Mukden — or «Flourishing Capital»— given to it by its conqueror nearly 200 years ago, being used only in official documents. It is a station on the Russo-Chinese Railroad, and is surrounded by walls laid out in regular parallelograms between one and two miles each way, and built of squared stone or brick, thick and massive at the base and tapering gradually to the top. These walls are 40 feet in height, 21 feet in width, and are protected at the top by an eight-foot crenelated parapet. Outside these walls there is a wide moat, and then come the suburbs, which extend for a mile or more on all sides. These again are enclosed by walls, which are constructed of mud. In the heart of the town is an inner wall, three miles in circuit, enclosing the emperor's residence, the government offices, courts and other buildings connected with them, which are arranged on a plan similar to those of Peking. In 1631 the Manchu monarchs made Mukden the seat of government, and succeeding emperors have done much to enlarge and beautify it. At Mukden are the tombs of the Manchu emperors, and the royal burying ground is ornamented with stone images of elephants as ponderous as some of the carved shapes that mark the graves of Egyptian kings. Other interesting relics of the past in the environs of the city are the Temple of Heaven and the Temple of Earth, both of which were built by Tai Tsung, and the remains of which are still to be seen.

Like all the cities of Manchuria, Mukden is laid out on a regular plan not unlike American towns. The main street runs due north and south, and the second best crosses it at right angles, while parallel to these run a series of alleys teeming with an industrious population.

The city suffered greatly during the uprising of the Boxers in 1900, and was used by the Russian army under Kuropatkin as a base of supplies during the Russo-Japanese War. It was captured (March 1905) by the Japanese army in one of the greatest and most remarkable battles of modern history. Pop. about 250,000. See Manchuria.

MUKHTAR PASHA, mookh-tär' păsh'â (Ghazee Ahmed), Turkish general: b. Brusa, Turkey, 1832. He was educated in the military schools in Brusa and in Constantinople and entered upon a military career. He served in the Crimean War, taught at the military school, became the military instructor of Prince Yusuf Iseddin, the favorite son of Sultan Abd-ul-Aziz, and was second in command of the expedition to Yemen in 1870, receiving the full command and the rank of field-marshal in 1871. In the campaign of 1860 in Montenegro he played a conspicuous part and thereafter received steady and rapid promotion. He became a full general in 1870 and in 1873 was appointed minister of public works. In the wars of Bosnia, Herzegovina and Montenegro in which he commanded he displayed great generalship, gaining 20 victories and never suffering defeat. The campaign of Kars-Erzerum in 1877 went against him and he was defeated by the Russian general Melikoff after a brilliant engagement for which he received the highest Turkish military title, «Ghazee.» In 1878 he was made grand master of the Turkish artillery, in which capacity he subdued the Cretan insurrection in that year, and in 1885 was designated to the post of Turkish High Commissioner in Egypt. He remained there about 10 years, and then returned to Constantinople. He was one of the commissioners in 1912 to arrange for a peace with Italy and to pacify Albania. In July 1912 he became Grand Vizier, but resigned in October.

MULA, moo'lą, Spain, town in the province of Murcia, on a branch of the Segura. It has ancient castle ruins, but is chiefly known on account of its iron and sulphur natural hot baths. Pop. about 11,922.

MULBERRY, a genus (*Morus*) of trees of the order *Moraceæ* (q.v.), of which 100 species have been described, but only five are now recognized. The mulberries are characterized by the possession of leaves variable in form even upon the same twigs; monœcious flowers in axillary catkins; and multiple blackberry-like fruits formed by the coherence of the pistillate flowers which became fleshy as they swell. They are natives of the mild parts of Asia, Europe and America, whence they have been taken by man to similar regions throughout the world. In the Old World various species are of economic importance, principally because their foliage supplies the food of the silkworm, and their fruit a dessert and a wine. The wood of most species is of inferior quality, but that of one species, the red mulberry (*M. rubra*), is fine-grained, strong and useful for ship-building. The trees are readily propagated by means of seeds, layers, cuttings or by graftage. They thrive upon almost any soil; even on rocky hillsides and gravelly lands, but succeed best upon arable soil in which they may be planted from 20 to 40 feet apart, and cultivated like other orchard fruits until they have full possession of the ground. The fruits, which are borne in great profusion, are too soft for market purposes, and usually too sweet for preserving alone. They are generally shaken from the trees upon sheets. Pigs are very fond of them.

The following are the most important species. The white mulberry (*M. alba*) is the silkworm mulberry, and has produced most of the named American varieties valued for their fruit, but not those esteemed in Europe. The black mulberry (*M. nigra*) is the European «dessert» species, and is little used for the feeding of silkworms. The red mulberry (*M. rubra*) is a native American tree to be found from Massachusetts to Nebraska and southward to the Gulf States. It has produced several good dessert varieties, the fruits, of which are characterized by greater acidity than those of the Old World sorts. It seems to be ill adapted to the feeding of silkworms. The so-called Russian mulberry is a variety of the white. It produces inferior fruits but is valued in the Plains States for wind-breaks, for which purpose its ability to resist extremes of drouth, cold and neglect specially fit it. All the above species have produced horticultural varieties, some variegated, others weeping, which are planted more for ornamental purposes than for fruit.

Another important species is the Indian (*M. indica*) which is used in silk culture and for its fruit, which is of fine flavor. It is cultivated in India, China and other countries of the East.

The allied paper-mulberry (*Broussonetia papyrifera*) is a native of Eastern Asia. This tree is of a moderate size, bearing leaves which are either simple or divided into lobes, more or less deep, rough above and hairy beneath. It was originally from India and Japan, but is now very commonly cultivated in Europe, and succeeds even in the more northern parts. The islanders of the Pacific make a kind of clothing from the bark of this tree in the following manner: Twigs of about an inch in diameter are cut and deprived of their bark, which is divided into strips, and left to macerate for some time in running water. After the epidermis has been scraped off, and while yet moist, the strips are laid out upon a plank in such a manner that they touch at the edges, and two or three layers of the same are then placed upon them, taking care to preserve an equal thickness throughout. At the end of 24 hours the whole mass is adherent, when it is removed to a large, flat and perfectly smooth table, and is beaten with little wooden clubs till it has attained the requisite thinness. This kind of cloth is easily torn, and requires to be washed and beaten many times before it acquires its full suppleness and whiteness. The natives dye it red and yellow, and also make a similar cloth from the bread-fruit tree, an allied plant; but that from the mulberry is preferred. The paper which is used in Japan and many other countries in the East Indies is made from this plant. For this purpose the annual shoots are cut after the fall of the leaves, tied in bundles, and boiled in water mixed with ashes; after which the bark is stripped off by longitudinal incisions, and deprived of the brown epidermis. The mark of the more tender shoots is separated from the rest, as it furnishes a white paper for writing, while that produced by the remainder is coarse and gray, and serves for wrapping or similar purposes.

MULCH, any material kept in a loose condition at the surface of the soil for the purpose of checking evaporation, conserving moisture, protecting plant-roots or low-growing plants from frost or heat, preventing puddling and washing of the soil, retarding growth in spring, keeping the surface soil open, supplying plant-food, protecting fruit or flowers from dirt, and keeping down weeds. The materials most frequently applied are straw, marsh-hay, leaves, litter and brush; but the most widely important mulch is the surface soil itself, kept powdery by frequent tillage, given especially after rains when it is desirable to break the crust formed upon the surface. Since mulches keep the soil beneath them moist by breaking the capillary, they are of particular advantage in dry climates; but since the vegetable mulches, such as straw and leaves, cannot be used in summer where the land must be cultivated and since they supply hiding places for insects, they can rarely be used advantageously in fruit plantations, in which they are often also a positive detriment because they encourage the growth of roots near the surface. In climates liable to extremes of temperature this position of the feeding roots is often disastrous to the crop if not to the plants themselves. Except, therefore, for winter protection, when such seems to be necessary, the soil itself is generally best. But the depth of the powdery layer will depend largely upon the climate, character of the soil, and kind of crop; in arid regions, with light soils, and with deep-rooted plants, the soil-mulches are usually deeper than with the reverse conditions.

MULDER, mool'dĕr, **Gerardus Johannes,** Dutch chemist and physician: b. Utrecht, Holland, 27 Dec. 1802; d. there, April 1880. He was educated at the University of Utrecht and became professor of botany and chemistry there (1840–68), but first practised medicine in Amsterdam for some years. He was also for a short time professor of chemistry at Rotterdam. He became known chiefly through his researches on the proteids, and advanced the belief in a hypothetical substance which he called protein. This he believed to be the essential nitrogenous constituent of food, existing in animals, and derived ready-formed from plants and vegetables. The publication of this theory involved Mulder in a controversy with Liebig, who from the first doubted the existence of protein as an independent chemical compound. The whole theory has been abandoned, and the word protein is now used to indicate the first element in compounds. His principal work ‘Chemistry of Vegetable and Animal Physiology’ has been translated into English by Fromberg, and his ‘Chemistry of Wine,’ by Bence Jones. He also wrote ‘Chemical Researches’; ‘De Voeding in Nederland’; ‘De Voeding van den Neger in Suriname,’ and his posthumous autobiography ‘Levensschets’ (1881; 2d ed. 1883).

MULE, *in zoology,* a term loosely used as synonymous with hybrid, more usually applied to the produce of a male ass with a mare, the mule proper, and to the hinny, the offspring of a stallion and a she-ass. The mule does not attain maturity as soon as the horse, but is useful a much longer period. As a beast of burden it is in some respects preferable to the horse; it is easily fed, is equally good for carrying and drawing, its less sensitive skin enables it to support exposure to the weather; like the ass, it enjoys comparative immunity from disease, and it is as surefooted as a goat. Mules have been known from the earliest ages; there are frequent references to them in Scripture and in Greek and Latin literature. Kentucky, Missouri and Kansas take the lead in mule-raising in the United States, and the small Mexican mule is a very useful animal. France is the most important mule-raising country in Europe; then come Italy, Spain and Portugal, where they are used for pack and draft. They are largely employed as draft animals in warfare. Fecundation of the hybrid-female by the male ass or the stallion is not very rare, though she rarely throws a living foal. Consult Fegetmeier, ‹Horses, Asses and Zebras› (London, 1895), and publications of the United States Department of Agriculture. (See HYBRIDITY). In 1923 there were 5,506,000 mules in the United States, valued at $472,735,000. The average value per head was $85.86. For further statistics see LIVESTOCK, AMERICAN.

MULE DEER, or BLACKTAIL, a deer of the western United States (*Odocoileus hemionus*), remarkable for its disproportionately large ears. Its common name «blacktail» among the hunters is due to the black color of the terminal part of the tail, distinguishing it from the «whitetail» or eastern deer (q.v.); but is better reserved for the Pacific Coast species. (See BLACKTAIL). This deer is rather larger than the eastern one and is a deer of the rocky plains, and especially of the mountains, which it climbs in summer as high as it can go, pasturing upon alpine slopes and resting upon the summits of cliffs and ledges where it has a wide outlook. Its gait is very distinctive, also, consisting of a series of jerking bounds very effective on declivities, but looking strange on a level plain. The character of the sport afforded by this deer depends much upon the kind of country in which it is hunted, the method of pursuit being very different in the chaparral of southern California from that followed among the broken plains of Montana. When hiding in summer it will often wait until almost touched before starting off. In winter it gathers into herds and wanders among sheltering hills and vales. It is therefore the characteristic deer of the Rocky Mountain region and was formerly exceedingly numerous and one of the principal sources of food and clothing for the Indians. Originally the species occurred commonly as far east as the plains and prairies extended; but was early exterminated in the central Mississippi Valley; and from about 1875 to 1895 was the object of persistent slaughter by hide hunters. At the beginning of the present century, therefore, it had nearly disappeared from the plains south of the upper Missouri, was scarce in the central Rockies and numerous only in the less frequented parts of the Northwestern States and adjoining provinces of Canada. Its hide makes the best tanned deer-leather (buckskin) and its flesh is excellent. The mule deer is not much taller than the Virginian deer, standing about three feet four inches high at the shoulder, but is heavier and of coarser build. The ears are very large and thickly haired, the tail roundish and white with black tip. The coat is dull yellowish in summer, palest in the southern desert varieties, but becomes bluish gray with the autumnal molt; face between the eyes dusky, elsewhere white; throat, abdomen and inside of the legs white; antlers forking equally and each prong again bifurcating. Consult Baillie-Grohman, ‹Fifteen Years' Sport and Life in the Hunting Grounds of Western America› (1900); Caton, ‹Antelope and Deer of America› (1877); Lydekker, ‹Deer of all Lands› (1898); Roosevelt (and others), ‹The Deer Family› (1902).

MULE-KILLER. See MANTIS.

MULE MACHINE, a spinning-machine in which the rovings are delivered from a series of sets of drawing rollers to spindles placed on a carriage, which travels away from the rollers while the thread is being twisted and returns toward the rollers while the thread is being wound. It was invented by Samuel Crompton, of Bolton, England, and perfected in 1779. The combination which gave rise to the term mule was the junction of the drawing rollers of Arkwright with the spinning jenny of Hargreaves. The object of the machine is to deliver the roving with the required degree of attenuation and twist it as delivered. For this purpose the spindles, instead of being stationary, are placed on a movable carriage which is wheeled out to twist the threads and wheeled in again to wind on the spindles.

MULE AS A WORK ANIMAL, The. The use of mules for doing the work of the world is almost as old as history. The historical records that have come down to us recounting the exploits and industrial achievements of the more civilized peoples of the earth have all mentioned the mule. The impression which one gathers from reading the opinions of the earlier peoples is that the mule was highly regarded, particularly as a burden bearer.

So far as the writer has been able to determine, there are no unfavorable reports of the work of mules. On the other hand the unanimous opinion of those who have had most to do with the utilization of mules is that they are in many respects the most efficient and satisfactory work animals employed by mankind.

In more modern history the evidence of the value of mules is still more thoroughly recognized. The number of mules in the United States has increased rapidly. One hundred years ago the mule was not generally used as a draft animal except in a few Southern States. At the present time the mule is used to a greater or less extent in every State of the Union. He is particularly valued in the South, in the Middle West and the West. In these great agricultural regions the mule has won a place in competition with horses and he will not be replaced unless we should ultimately come to a type of farm practice which will make it possible to employ mechanical motors exclusively for agricultural production.

The favorable opinion of mules as work animals is not due to any accident nor indeed to any peculiar psychology of those who have used the mule largely in their industrial occupations. There are certain outstanding qualities characteristic of the mule which single him out from among other types of draft animals and have made him what he is to-day — undoubtedly one of the most popular and economical of draft animals.

The mule is recognized as possessing unusual endurance, exceptional courage, sure-footedness, steadiness and is exceptionally free from excitability and harmful nervousness. The mule is also given credit for the possession of an unusual amount of instinctive wisdom which protects him against many of the dangers and accidents to which horses are subject.

No draft animal so far developed has the endurance of the mule under all kinds of hard working conditions. In the excessive hot climate of the tropics mules will work steadily day after day without injury to themselves and will accomplish an astonishingly large amount of productive labor. Under similar conditions horses are far less efficient and indeed it is plain that under many such conditions horses are entirely unable to accomplish the work. On the arid plains and in the desert regions of the world the endurance of the mule has been recognized and particularly where the trails are rocky the mule outlasts any other draft animal.

A part of the endurance of the mule is due to his temperament, a part to his sound, thoroughly good feet and a part to his instinctive food habits. The mule is not so well adapted to the sandy stretches of the arid regions because his small, somewhat pointed foot causes him to sink more deeply into the sand than flat-footed horses. The mule is sure-footed. Over the dangerous trails of the mountains the mule rarely meets with an accident. He is wise in selecting his foothold and will carry the rider or pack safely along precipitous trails where under similar conditions horses would be unsatisfactory.

On the farms, particularly of the Middle West and the South, the mule is more economical. The statement is frequently made that the mule requires less food for the performance of a given amount of work than the horse. This is the general opinion among farmers experienced in the use of mules. Investigations on this point are not numerous and are not thoroughly convincing, but in the main the conclusion that mules will consume less food than horses is probably true. It is certainly true that mules will thrive on a coarser character of fodder. They will thrive under conditions which would be impossible for horses.

The mule will rarely if ever injure himself by over-heating, over-eating or drinking when he is too hot. Under similar conditions horses are frequently injured and their usefulness greatly diminished.

This interesting hybrid, descended from the ancient wild ass of the deserts, has inherited a certain type of wisdom which protects him from the dangers incident to civilization. The mule avoids accidents. On the farms of Missouri where mules attain their highest development the risk from rearing young mules, so far as acquiring blemishes is concerned, is much smaller than the risks from similar accidents among young horses. This is an economic factor which is clearly recognized and one which constitutes an argument for the increased profit in the raising of mules. In the earlier use of mules in this country the small, active, hardy mule of good quality was universally favored. In more recent years with the larger use of heavy farm machinery, larger mules have been in demand. At the present time (1919) the large draft mule of good quality sells for the highest price on the market. The draft mules are not only used in the cities for heavy hauling but farmers also now more often demand the heavy mule than in former years. The smaller mules, known on the market as «cotton» mules, are more generally sold in the South. The draft mules are sold in the mining regions, for city drayage and on larger farms of the Middle West. The «sugar» mule is a larger mule than the «cotton» mule and is demanded in the cane-growing regions of the South. The demand for large draft mules has caused the breeders of jacks and jennets to produce a large jack of good quality. This animal mated to the mares belonging to the principal draft breeds of the United States is the source of the draft mules of America. These draft mules may perhaps lack somewhat in quality as compared with the smaller, more active mules of earlier history but they do possess a power and efficiency in the hauling of heavy loads which is comparable to the similar power of great draft horses so long used on the city streets.

This brief article on the value of the mule as a work animal would not be complete without recognizing the great value of the mule in war. During the great European War the Allies made large use of the mule in transporting artillery and supplies, particularly in carrying supplies to the front. The mule because of his courage and steady, reliable subservience was dependable under fire and could be used where horses could not be employed.

The rearing of mules has come to be as much an art based upon scientific principles of breeding as has the production of any other class of domestic animals. While it is true that the mule is a hybrid and always sterile, the principles of breeding which may be applied in his production are more complicated and involve the successful breeding of two distinct species, it is nevertheless true that the value of the mule for industrial purposes is to-day as largely dependent upon the skill of the breeder as is the breeding of cattle, horses, sheep or swine.

FREDERICK B. MUMFORD,
Dean and Director of the College of Agriculture, University of Missouri.

MULFORD, Elisha, American Episcopal clergyman and philosophical writer: b. Montrose, Pa., 10 Nov. 1833; d. Cambridge, Mass., 9 Dec. 1885. He was graduated from Yale in 1855 and subsequently studied theology, law and philosophy. He entered the Episcopal ministry and held several rectorates, but from 1881 lived in Cambridge, Mass. He wrote 'The Nation' (1870), a treatise on the philosophy of the State, and 'The Republic of God' (1881), relating to the philosophy of religion. From 1881 till his death he taught at the Episcopal Theological School at Cambridge, Mass.

MULHALL, Michael George, Irish statistician: b. Dublin, Ireland, 1836; d. Killiney, Ireland, 12 Dec. 1900. He was educated in the

Irish College at Rome, and in 1861 went to Buenos Aires, where he founded the *Standard*, the first English daily paper in South America. He gained a wide reputation as a statistician, and in 1880 made a calculation of the census of the United States for 1900 which came within 95,000 of the number given by the census report in that year. He was a frequent contributor to the *Contemporary Review*, and published 'Rio Grande do Sul and Its German Colonies' (1873); 'A Dictionary of Statistics' (1883); 'Fifty Years of National Progress, 1837–87' (1887); 'Industries and Wealth of Nations' (1896), etc. His wife, MRS. MARION MULHALL, wrote 'Between the Amazon and the Andes' (1883); 'Celtic Sources of Dante's Divine Comedy.'

MÜLHAUSEN, mül'how-zĕn, or **MUHLHAUSEN** (French, MULHOUSE), France, a town of Alsace-Lorraine, on the Ill River and the Rhine-Rhône Canal, 66 miles by rail southwest of Strassburg, and 18 miles northwest of Basel, Switzerland. It is an important commercial and manufacturing centre, cotton spinning being one of the largest industries. The town carries on calico printing, dyeing, the spinning of woolen and worsted yarn, the manufacture of machinery, railway material and numerous other industries. Its industrial importance dates from 1746, when a cotton-factory was established. It is noted for its model dwellings for the working classes in the «cité ouvrière,» workingmen's colony, on the northwest, founded by Mayor Dollfus in 1853. A migration to the suburbs, however, left the artisan colony in the occupation of small tradesmen. Mülhausen is first mentioned in 717; it became an imperial free city in 1273, and in the 15th century entered into an alliance with the Swiss, which lasted till 1798, when it became French. It was included in the cession of Alsace to Germany in 1871. In the great European War (q.v.) it was the scene of considerable military activity. Pop. about 95,000.

MÜLHEIM, mül'hīm, or **MUHLHEIM**, Prussia, two towns of the Rhine province: (1) Mülheim-on-the-Rhine, with a bridge spanning the river, is almost opposite Cologne. The town has manufactures of machinery, cables, wire ropes, wagons, velvet, silk, chemicals, etc. From 1914, the town with Cologne suffered from the operations of Allied aviators during the great European War. Pop. 53,500. (2) Mülheim-on-the-Ruhr, 14 miles north of Düsseldorf, has coal and iron mines, iron foundries, manufactures of iron-ware, machinery, glass, woolen and cotton goods, and a considerable trade in sandstone, building materials and coal. The Ruhr is crossed here by a chain bridge and a railway bridge. Pop. about 112,500.

MULHOLLAND, mŭl'hŏl'ănd, **William**, American hydraulic engineer: b. Belfast, Ireland, 11 Sept. 1855. He was educated at the Christian Brothers' School, Dublin. Coming to the United States, he became superintendent and chief engineer of the waterworks of Los Angeles, Cal., from 1886. He devised the plans and estimates, then superintended the construction of the Los Angeles aqueduct to bring to the city water from the Sierra Nevada Mountains, a distance of about 250 miles, at a cost of $24,500,000. He has been consulting engineer on many projected water supply and irrigation plants.

MULITA, a small armadillo, with head and ears like those of a mule, native to southern South America.

MULL, Scotland, an island of Argyllshire, the largest of the Inner Hebrides next to Skye. Its length is 35 miles; greatest breadth, 30; superficial area, 347 square miles. It is irregular in shape, and the large bay on the west side contains a number of islands, including Ulva and Staffa. Iona lies off its southwest extremity. The island is rugged and mountainous; Benmore, the highest mountain, is over 3,000 feet above the level of the sea. The principal village is Tobermory; pop. about 1,000. Between the island and the mainland, on the northeast, is the Sound of Mull, from one to three miles wide.

MULLANY, mŭl-lā'nĭ, **James Robert Madison**, American naval officer: b. New York, 26 Oct. 1818; d. Bryn Mawr, Pa., 17 Sept. 1887. He was appointed to the navy as midshipman in 1832 and received steady promotion, becoming lieutenant in 1844. He served with distinction in the Mexican War, and at the outbreak of the Civil War in 1861 was promoted commander. He commanded the *Oneida* in the battle of Mobile Bay and performed valiant service with her on that occasion, losing his left arm. He was commissioned commodore in 1870 and rear-admiral in 1874, and until 1876 was in command of the North Atlantic squadron, and in conjunction with General Emory and General Sheridan at New Orleans protected American interests on the Isthmus of Panama. From 1876 until 1879, when he was retired from active service, he was governor of the naval station at Philadelphia.

MULLANY, Patrick Francis. See AZARIAS, BROTHER.

MULLEIN, a genus of biennial and perennial herbs (*Verbascum*) of the natural order *Scrophulariaceæ*. The species, of which more than 100 have been described and more than 30 are cultivated, have tap roots, woolly foliage in rosettes during the first year, and terminal spikes or racemes of small, usually yellow, flowers which appear from midsummer until late autumn. Some species were formerly reputed medicinal. In America they are usually considered as weeds, but in Europe they are valued as ornamental plants, particularly for mixing with shrubbery and planting in the rear of flower borders. Though natives of the Mediterranean region, some species are known in England as American flannel or velvet plant. The best-known species in the United States are probably the moth mullein (*V. blattaria*), the common mullein (*V. thapsus*), the white mullein (*V. lychnitis*), and *V. phlomoides*, which are all common in pastures and uncultivated fields.

MÜLLER, mü'lĕr, **Adam Heinrich**, German economist: b. Berlin, 1779; d. 1829. In his 19th year he went to the University of Göttingen, where he at first occupied himself with theology and then became a student of jurisprudence, in which he was a pupil of Hugo. He afterward sought to complete his education by the private study of the natural sciences, which he had previously neglected.

He early formed a close intimacy with Friedrich Gentz, his elder by 15 years; and this connection exercised an important influence both on his material circumstances and his mental development in after life. The two men differed widely in character and in their fundamental principles, but agreed, at least in their later period, in their practical political aims, and the friendship was only terminated by death. Müller's relations with the Junker party and his co-operation with them in their opposition to Hardenberg's reforms made any public employment in Prussia impossible for him. In 1805 he was in Vienna, where he became a convert to Roman Catholicism, and through Gentz was brought into relations with Metternich, to whom he was useful in the preparation of state papers. In 1806–09 he was in Dresden, being occupied in the political education of Prince Bernhard of Saxe-Weimar. In 1813 he entered the Austrian service, and in 1815 accompanied the Allies to Paris. He was ennobled by the emperor in 1820. In 1827 he settled a second time in Vienna, and was employed in the state chancellery. He was one of the principal literary instruments of the reaction and took part in framing the Carlsbad resolutions. He was distinguished as a writer not only on politics and economics, but on literature and æsthetics. His principal work is his ‘Elemente der Staatskunst’ (1809), which contains the substance of a course of lectures delivered at Dresden to statesmen and diplomatists. In political economy he represents a reaction against the doctrines of Adam Smith, whom, while he highly commends him in certain respects, he censures as presenting a one-sidedly material and individualistic conception of society, and as being too exclusively English in his views. Müller's leading idea is that of the organic unity and continuity of the state and of social institutions in general. Some of his higher tendencies, freed from much of their alloy, are reproduced in the writings of the historical school of German economists. Other works by Müller are ‘Die Theorie der Staatshaushaltung und ihre Fortschritte in Deutschland und England seit Adam Smith’ (1812); ‘Versuch einer neuen Theorie des Geldes’ (1816); ‘Vermischte Schriften über Staat Philosophie und Kunst’ (2 vols., Vienna 1817); and ‘Von der Nothwendigkeit einer theologischen Grundlage der gesammten Staatswissenschaften und der Staatswirthschaft insbesondere’ (1819). Consult biographical notice of Mischler in ‘Allgemeine Deutsche Biographie.’

MÜLLER, Charles Louis, French painter: b. Paris, 22 Dec. 1815; d. there, 10 Jan. 1892. He was the pupil of L. Cogniet, Baron Gros and others in the Ecole des Beaux-Arts, and in 1850 was made director of the manufactory of Gobelin tapestries. His fertility in the production of historic pictures and portraits was amazing. Among them are ‘Heliogabalus’ (1841); ‘Primavera’ (1846); ‘May-day’; ‘Lady Macbeth’; and his masterpiece, ‘The Last Victims to the Reign of Terror’; the last two being in the Luxembourg; ‘Vive l'Empereur’ (1855); ‘Marie Antoinette’ (1857); ‘A Mass During the Reign of Terror’ (1863); ‘The Madness of King Lear’ (1875); ‘Mater Dolorosa’ (1877). He executed the frescoes of the Salle d'Etat in the Louvre, and as a painter is more to be commended for clever drawing and composition than for his somewhat flat and mediocre coloring. In 1864 he became a member of the Institute.

MÜLLER, Friedrich, called «Maler Müller,» or «Müller the Painter,» German artist and poet: b. Kreuznach, 13 Jan. 1749; d. Rome, 23 April 1825. Some of his etchings, animals, compositions in the Flemish style, pastoral scenes, etc., were remarkable for their originality and freedom. He deserves more credit as a poet, for at a time when German poetry had degenerated, Müller helped to give a new impulse to German literature. His best works, ‘Nible,’ ‘Faust’ and ‘Genevieve,’ are characterized by richness, warmth and elevated delineation of character, though sometimes wild and disconnected.

MÜLLER, Friedrich Max (known as Max Müller), English philologist: b. Dessau, Germany, 6 Dec. 1823; d. Oxford, 28 Oct. 1900. His father was Wilhelm Müller (q.v.), a famous German lyrist, and his maternal great-grandfather Basedow, the eductional reformer. His bringing up was in his mother's hands, as his father died when the boy was four. He studied in Leipzig, at the Nicolaischule; had some thoughts of becoming a musician, but entered the University of Leipzig in 1841, and there, under the leadership of Hermann Brochaus, devoted himself to Sanskrit, publishing a German version of the ‘Hitōpadēša’ in 1844; worked under Bopp in philology and Schelling in philosophy at Berlin for a year; in 1845 went to Paris, where Burnouf suggested to him an edition of the ‘Rig Veda’; and in 1846 went to England and interested the East India Company in this work, which he undertook at the expense of the company. He was in Paris in 1848, and brought to Palmerston, in London, the first news of Louis Philippe's flight from Paris. In the same year he settled in Oxford, where the ‘Rig Veda’ appeared, with Sāyana's commentary, 1849–74. He became deputy Taylorian professor in 1850, and Fellow of All Souls' in 1858; but in 1860 was defeated in his candidacy for the chair of Sanskrit by Monier Williams, after a fierce fight on the part of his opponents, who objected partly to his foreign birth and partly to his very free and unorthodox religious views. The result for linguistic science was unfortunate, as it turned Max Müller from the narrow field of Sanskrit, in which he easily outranked his contemporaries, to comparative philology and the science of religion, in which his achievements were less exact and scholarly, to say the least. In 1868 he became professor of comparative philology at Oxford. He was made a privy councillor in 1896. His greatest single work was as editor of the ‘Sacred Books of the East,’ a series of English versions of Oriental scriptures, to which he contributed three volumes, and which was begun in 1879 and is not yet complete. He is possibly even better known as a popularizer of the first principles of linguistic science, so that he became in the lay mind the main exponent of this science, whereas his grasp of its detail was inadequate, and many of the etymologies he advanced showed that he was not conversant with the strict rules of phonetics. But the charm of his style, his general grasp of so large a subject, and his admitted pre-eminence in Sanskrit, make interesting and valuable, if not absolutely authoritative, reading of ‘The Science of Language’ (1861–63); ‘Essays on Language and Literature,’ and ‘Biographies of Words’ (1888), all of which have passed through new editions. Max Müller's works on mythology and religion also have a higher repute among general readers than with the specialist, but it cannot be denied that they did much good in stimulating research, as the ‘Sacred Books’ did in supplying a field for such research. In this class of writings mention should be made of the ‘Essay on Comparative Mythology’ (1856); ‘Introduction to the Science of Religion’ (1873); ‘The Origin and Growth of Religion’ (1878); ‘Natural Religion’ (1889); ‘Physical Religion’ (1891); ‘Anthropological Religion’ (1892); ‘Theosophy, or Psychological Religion’ (1893); the ‘Essays on Mythology and Folklore’ in the 4th volume of ‘Chips from a German Workshop’; and ‘Contributions to the Science of Mythology’ (1897). His versions from the Sanskrit and the Pâli have been alluded to; ‘A History of Ancient Sanskrit Literature’ (1859), and a ‘Sanskrit Grammar’ also should be mentioned, and it should be borne in mind that it is in this field that the scholar spoke with authority. From his youth Max Müller was interested in philosophy; he wrote an excellent version of Kant's ‘Critique of Pure Reason’ (1881); also ‘The Science of Thought’ (1887), urging that thought was inconceivable without language, and the Oriental studies, ‘Three Lectures on the Vedânta Philosophy’ (1894), and ‘The Six Systems of Indian Philosophy’ (1899). An entirely different side of the man is disclosed by ‘My Indian Friends’ (1899), which shows much of his broad and charming personality; or by ‘Deutsche Liebe’ (1857), a romantic and popular story translated into French, Italian and Russian, and appearing in English in two versions, one American, unauthorized and very successful, and a later one (1873) by Mrs. Max Müller. He also edited his father's poems (1868), and Scherer's ‘History of German Literature.’ His collected works, including the four volumes of ‘Chips from a German Workshop’ (1867–75), appeared 1898 et seq. Consult his own ‘Auld Lang Syne’ (1898), and ‘My Autobiography’ (1901); his wife's ‘Life and Letters of Max Müller (1902); and Whitney, W. D., ‘Max Müller and the Science of Language’ (New York 1892).

MÜLLER, Georg Friedrich, German-English philanthropist: b. Kroppenstädt, Prussia, 27 Sept. 1805; d. Bristol, England, 10 March 1898. Entering the University of Halle as a student of theology in 1825, although he had fallen into irregularities of life, he was converted before the end of that year, and in the following year began to preach and teach. In 1829 he went to London, whither the Society for Promoting Christianity Among the Jews had invited him, settled at Teignmouth as pastor of Ebenezer Chapel, where he gave up pew-rents and substituted box-collections, finally refusing a salary and depending on voluntary gifts. In 1832 he joined Henry Craik, a prominent member of the sect of Plymouth Brethren, in ministerial work at Bristol. In 1835 he published a proposal for the establishment of an orphan home, which took shape in 1836 at Bristol. The experiment was successful, the work grew from year to year, and by 1875 no less than 2,000 children were lodged, fed and educated without other financial maintenance than that received in donations from all parts of the world. The orphanage was moved in 1849 to Ashley Down, a suburb of Bristol. With his wife Müller made evangelistic tours in Europe, America and Asia. He published ‘A Narrative of Some of the Lord's Dealings with Georg Müller’ (1837). Consult biographies by Pierson (New York 1899); by Warne (New York 1911).

MÜLLER, Johann Friedrich Theodor, yō hän frēd'rĭʜ tā'ō-dōr (better known as Fritz Müller, and also known as Müller-Desterro), German naturalist: b. near Erfurt, 31 March 1821; d. 1897. After studying at the universities of Greifswald and Berlin, he went to South America in 1848, and settled on the island of Santa Catharina, Brazil, living there the ordinary pioneer's life until appointed (1856) to teach natural history and mathematics in the Desterro gymnasium. From 1874 he was engaged for a time as collector for the museum at Rio de Janeiro. His published papers on crustaceans, insects, worms, jellyfishes, etc., were many, most of them appearing in the ‘Annals’ of the Rio de Janeiro Museum, Wiegmann's ‘Archiv für Naturgeschichte,’ and similar publications. In his ‘Facts for Darwin’ (1864), a book written under the stimulus of Darwin's ‘Origin of Species,’ he made valuable applications of Darwinianism in new fields, and won reputation among men of science for the originality and fertility of his observations and deductions. Among the more important pieces of work which he did were researches on mimicry (q.v.) and the first clear statement of the theory of recapitulation (q.v.).

MÜLLER, Johann Gotthard von, German engraver: b. Bernhausen, near Stuttgart, 4 May 1747; d. Stuttgart, 14 March 1830. After studying under Guibal, the painter, he turned to engraving, and in 1770 went to Paris, where, under Willie, he studied for six years, and after winning several prizes was elected to membership in the French Academy. Returning in 1776 to Stuttgart, he taught there for nine years. While there he was called to Paris to engrave a portrait of Louis XVI. This is regarded as his most important work, next to which may be ranked his ‘Battle of Bunker Hill,’ after Trumbull; ‘Madonna della Seggiola,’ after Raphael, etc. He was knighted in 1818.

MÜLLER, Johannes, German physiologist: b. Coblenz, Prussia, 14 July 1801; d. Berlin, 28 April 1858. He studied, from 1819, at Bonn and Berlin, started service (1824) as private dozent of physiology and comparative anatomy at Bonn, and became assistant professor (1830), then (1833) professor of anatomy and physiology at Berlin. His first important works, ‘Zur vergleichenden Physiologie des Gesichtsinns’ (Leipzig 1826) and ‘Uber die phantastischen Gesichtserscheinungen’ (Coblenz 1826), are of a subjective philosophical tendency, the first concerning the most important facts as to human and animal sight; the second sounds depths of difficult psychological problems. He soon became the leader in the science of the morphological treatment of zoology as well as of experimental physiology. To his active researches (1830) are due the foundation of the Bell law concerning the work of the roots of the nerves of the spinal marrow, the settlement of the theory of reflex action, the more exact knowledge of the blood's constitution, lymphs, chyle, etc. He even investigated the vocal organs and sound expression, producing fundamental work on the sense of hearing. He finished his great work 'Handbuch der Physiologie des Menschen' (Coblenz 1833–40; 4th ed., 1841–44) in Berlin. It has been translated into English under the title 'Elements of Physiology' (1837–43). The work discloses an entire knowledge of physiology, including comparative organology and medical histology from their microscopical and chemical viewpoints. The work was epoch-making. From 1833 he issued numerous treatises on comparative and pathological anatomy and systematic zoology. Of such should be cited 'Der verglichende Anatomie der Myxinoiden' (Berlin 1835–41); 'Beschreibung der Plagiostomen' (ib. 1838–41), in collaboration with Jacob Henle; 'Ueber den Bau und die Grenzen der Ganoiden und das natürliche System der Fische' (ib. 1844); 'Ueber die Larven und die Metamophose der Echino-dermen' (ib. 1849). His 'Ueber den feineren Bau der krankhaften Geschwülste' (ib. 1838), which was never finished, was a pioneer for microscopical research in pathological anatomy. From then on he worked almost exclusively in the realm of comparative anatomy and brought forth numerous researches concerning the lower animals. He took 19 trips to the Baltic and North Sea, the Adriatic and the Mediterranean to investigate salt-water life. It is declared of him that he was the most versatile, fruitful, genial and lucky investigator of modern days, and he maintained his vitality till the end. He never questioned the rights of philosophy or even faith nor positive religion, but no single being has done more toward placing physics and chemistry in their correct place in physiology and establishing the true method in contrast with the errors of natural philosophy, spiritualism and orthodoxy, for all time. From 1834 he published *Archiv für Anatomie, Physiologie und wissenschaftliche Medizin*. In 1899 a bronze statue was erected in his memory at Coblenz. Consult his biographies by Virchow (Berlin 1858) and De Bois-Reymond (ib. 1860).

MÜLLER, Johannes von, German-Swiss historian: b. Schaffhausen, 3 Jan. 1752; d. Cassel, 29 May 1809. He studied at Göttingen, and in 1772 became professor of Greek at the gymnasium at Schaffhausen, and published 'Bellum Cimbricum,' his first work. He lived and taught in Geneva 1774–80, where he began his 'Allgemeine Geschichte' (3 vols., 1810), and published the first volume of his 'Geschichte der Schweitzer.' From 1781 to 1786 he taught history and statistics at the Collegium Carolinum at Cassel. In 1786 he became librarian and councillor of state to the Elector of Mainz. Here he wrote his 'Geschichte der schweizerischen Eidgenossenschaft' and several other works. In 1792, when Mainz was taken by the French, he went to Vienna, where the Emperor Leopold nominated him a member of the Privy Council. In 1804 he left Vienna for Berlin, where he was appointed historiographer of the Hohenzollern family. He also published 'Ueber die Geschichte Friedrich I'; 'Ueber den Untergang der Freiheit der Alten Völker'; 'Versuch über die Zeitrechnungen der Vorwelt.' After the battle of Jena, he was appointed by Napoleon (1807) Secretary of State in the new kingdom of Westphalia. His 'Sämmtliche Werke' appeared in 27 volumes (1800–17); (new ed., 40 vols., 1831–35). Consult lives by Heeren (1820); Döring (1835); Monnard, in French (1839), and Thiersch (1881).

MÜLLER, Julius, German theologian: b. Brieg, Prussia, 10 April 1801; d. Halle, Germany, 27 Sept. 1878. He was educated at Breslau and Göttingen, and abandoned the study of law for theology. He was opposed to the Rationalists, and in 1825–31 was in charge of several small parishes. In 1831 he was preacher at Göttingen University, and in 1834 was elected professor of theology there. From 1835–39 he was professor in Marburg, and for the remainder of his life filled the chair of theology at Halle. His greatest work is 'Die christliche Lehre von der Sünde' (1829; trans. Edinburgh 1868), and among his other books are 'The Evangelical Union' (1854); 'Dogmatische Abhandlangen' (1870), etc.

MÜLLER, Karl Otfried, German archæologist and philologist: b. Brieg, Silesia, 1797; d. Athens, 1 Aug. 1840. The son of a field preacher, his education began at the gymnasium of his native town. He was then sent to Breslau, and afterward went to Berlin, where, as a pupil of Böckh, he devoted himself to the study of the life and art of the ancients. After publishing the 'Ægineticorum Liber' (1817) he was appointed instructor in the Magdalum at Breslau. Here he made an elaborate analysis of Greek mythology, separating allegorical inventions from true history. In 1819 he was made professor of philology and in 1823 became professor ordinarius at Göttingen. He was a great traveler, and his writings embrace the whole circle of antiquity. His intention was undoubtedly to concentrate the results of his whole life of scholarly activity in his great work, 'Geschichte hellenischer Stämme und Städte.' He only completed two volumes, however: Vol. I, 'Orchomenos und die Minyer' (1820), and Vol. II, 'Die Dorier' (1824). One of his best-known works, 'A History of the Literature of Ancient Greece,' a translation by Lewis and Donaldson from the author's manuscript, was published in London in 1840, and the continuator, Donaldson, published another edition in 1858. His 'Kunstarchäologische Werke,' in five volumes (1872–73), is a valuable work. Müller's 'Æschylus's Eumenides' (Göttingen 1833) was the object of a profound controversy in which Gottfried Hermann and his followers attacked him with great bitterness. Karl Müller was also prominent as an editor. Consult the biography by F. Ranke (1870).

MÜLLER, Morten. See MORTEN-MULLER.

MÜLLER, Victor, German historical painter: b. Frankfort, 29 March 1829; d. Munich, 21 Dec. 1871. Beginning his artistic career at the Frankfort art school, he continued it at Antwerp and ultimately went to Paris (1849), where he stayed for 11 years, diligently studying the methods and manner of Couture, Delacroix and Courbet. He settled in Munich in 1865, and for the castle of Kronberg in the Taunus painted a series of scenes from the history of Baron Hartmuth von Kronberg. He also produced his famous 'Hero and Leander.' Following these works came 'Hamlet with Horatio in the Churchyard'; 'Ophelia'; 'Romeo and Juliet,' and his last and unfinished work, 'Faust on a Stroll.' Among his other works are 'Wood Nymph'; 'Tannhäuser in Venusberg'; 'A Scene from Les Misérables.' His last finished picture was a 'Flower Girl.' All of his works are distinguished by a certain literary or poetic character which appeals to the fancy like a strain of lyric music, although the coloring sometimes runs in its vividness to the verge of extravagance.

MÜLLER, Wilhelm, German poet: b. Dessau, 7 Oct. 1794; d. there, 30 Sept. 1827. He studied at Berlin, but the war of 1813 called him from his books, and he was present as a volunteer in the Prussian army at the battles of Lützen, Bautzen, Hanau and Kulm. In 1814 he returned to his studies at Berlin. His journey to Italy (1819) produced his ingenious work 'Rom, Römer und Römerinnen' (1820), and on his return to Germany he became teacher of Latin and Greek in the newly-established school at Dessau, where he was also appointed ducal librarian. In 1824 appeared his 'Gedichte aus den hinterlassenen Papieren eines reisenden Waldhornisten.' His 'Lieder der Griechen' (1821–24) celebrate the awakening of an oppressed nation, its struggle and its victory. His 'Lyrische Spaziergänge' (Leipzig 1827) displays the same truth to nature, freshness and fire and the same harmony of language which characterizes his other poems. Many of his poems imitate with utmost perfection the true German Volkslied. Several of the 'Müllerlieder' are familiar through Franz Schubert's remarkable musical settings. His 'Bibliothek deutscher Dichter des 17. Jahrhunderts' (1822–27) is a valuable collection of the best lyric poems of that period. His works were collected in five volumes (1830). He was the father of Prof. Max Müller, the well-known philologist. A critical edition of his works appeared at Berlin in 1906. Consult Hako, B., 'W. Müller, Leben und Dichten' (Berlin 1908).

MÜLLER, Wilhelm Max, American Orientalist: b. Gleissemberg, Germany, 15 May 1862; d. 12 July 1919. He studied at the universities of Erlangen, Leipzig, Berlin and Munich, obtaining the degree Ph.D. at Leipzig. In 1888 he became a resident of the United States, but spent much time making researches in Egypt (1904, 1906 and 1910) under the auspices of the Carnegie Institution. He was professor in the Reformed Episcopal Seminary at Philadelphia after 1890 and assistant professor of Egyptology at the University of Pennsylvania. He wrote 'Asia and Europe after the Egyptian Monuments' (1893); 'The Love Poetry of the Ancient Egyptians' (1899), both of which are in German; 'Egyptological Researches' (1906–10); 'Mythology of the Ancient Egyptians' (in 'Mythology of all Races,' 1918). He was also a contributor to the 'Encyclopædia Biblica,' 'Jewish Encyclopædia' and joint editor of 'Gesenius Hebrew Dictionary' (1905).

MULLER, mŭl'ler, **William James,** English painter: b. Bristol, 28 June 1812; d. there, 8 Sept. 1845. He studied painting under J. B. Pyne, and first exhibited in the Royal Academy in 1833, his picture being entitled 'The Destruction of Old London Bridge — Morning.' In 1833–34 he visited Germany, Switzerland and Italy, and in 1838 Greece and Egypt; while in 1843 he accompanied the Lycian expedition under Sir Charles Fellowes, bringing back many sketches and pictures of Oriental life and scenery. He lived for some time in London, but returned to Bristol in later life. His pictures, though not numerous, are of exceptional power and merit, among the more notable being the 'Baggage Wagon'; 'Dredging on the Medway'; 'The Slave Market'; and the 'Salmon-weir.' He painted both in water-color and in oils, and was remarkable as a colorist. Consult the 'Memoir' by Solly (London 1875).

MULLER-URY, Adolfo, Swiss-American portrait painter: b. Airolo, Switzerland, 28 March 1864. He was educated at the public schools and at Sarnen and became a pupil of Deschwanden at Stans, Switzerland, after which he entered the Munich Academy and then went to Paris to study under (1881–83) Cabanel. From 1883–85 he worked at Rome and came to the United States in 1886. He has done numerous canvases on religious subjects but his paintings are mostly portraits, among which figure Pope Pius X, several cardinals, Bishop Kennedy (1907), some English nobility and other European personages. In this country he has painted among other portraits those of President McKinley, General Grant, Senator and Mrs. Depew, Senator Hanna, J. Pierpont Morgan, J. J. Hill, Mrs. Woodrow Wilson (1916), President Wilson (1917), etc.

MULLET, the name of several distinct kinds of fishes having external similarities. (1) The red mullets or surmullets are a group of elongate marine fishes of moderate size, renowned for the delicacy of their flesh, and the esteem in which they were held by the ancients. They with the goat fishes (*Upeneus*) and others form a family *Mullidæ,* with five genera and about 40 species, found in all tropical seas, and some species straying northward. Jordan, who classifies them in the suborder *Berycoidei,* remarks: "The family is a very natural one and not closely related to any other." It resembles the barracudas (*Polymixiidæ*) in having two long unbranched erectile barbels at the throat, which are of service in exploring the muddy bottom along which these fishes creep and search for animal food, mainly small crustaceans. The best-known species is that of the Mediterranean (*Mullus barbatus*), which is a small fish, rarely exceeding six inches in length, and is carmine red on the upper parts and silvery white on the lower surface. This is the fish held in so high esteem by Roman epicures, and reared in ponds where they were attended and caressed by their owners, and taught to come to be fed at the sound of the voice or bell of the keeper. Specimens were sometimes sold for their weight in silver. Pliny instances a case in which the sum of about £60 sterling was paid for a single fish; and an extraordinary expenditure of time was lavished and wasted upon these slow-learning pets. Juvenal and other satirists descanted upon the height to which the pursuit of this luxury was carried as a type of foolish extravagance. Hortensius, the rival of Cicero, we are told, had a canal of water constructed below the festive table, in which the mullets were allowed to swim, and from which they might be carried to table, and thence to the fire to be cooked and dressed. Apicius invented a mode of drowning or suffocating these fishes in a certain sauce or pickle, which process was said to add highly to their flavor. A similar fashion prevailed of old in England with regard to lampreys, which were drowned in wine previously to being cooked and eaten. This mullet is still esteemed as an article of food, the flesh being white, fat and nutritious. They are caught mainly in nets and are hawked about the streets of Italian cities, not under the old Latin name «mugli,» but by one from the Greek, «trigle.» The roes are preserved as condiment called *botargo* and resembling caviare.

A closely related fish, the striped red mullet or surmullet (*M. cephalus*), is caught abundantly about the British Islands and along the continental coast, and is seen sparingly in the local markets. By some naturalists these mullets are thought to be only the females of the Mediterranean species. A smaller form of the same species is frequently taken on the eastern coast of the United States. Another genus (*Mullolides*) is represented in the Gulf of California by a single species.

(2) The gray mullets are a group of spiny-rayed marine fishes forming a family (*Mugilidæ*) of the suborder *Percesoces*, allied to the silversides and barracudas. They are oblong fishes of moderate size, without a lateral line, very numerous in species common in all warm parts of the world, and often appearing in vast schools, so that they may be captured by wholesale in large nets. Though the flesh is not so good as that of the red mullets it is nutritious, and many species are economically important. These mullets are short-finned, small-mouthed, bottom-feeding fishes, subsisting chiefly upon the little animals or organic matter found in sand and mud; and they have a special straining apparatus in the pharynx for the purpose of preventing objects of too large size from entering the stomach, or foreign substances getting into the gill-chamber; after grinding a mouthful between the pharyngeal bones (for teeth are absent or feeble) the mineral matter is rejected. Another peculiarity of the mullets is to be found in the structure of the œsophagus and stomach, the former being lined with long thread-like papillæ, while the latter has its second portion furnished with muscular walls like the gizzard of a bird, but not divided. The common species is the striped or liza (*Mugil cephalus*) which seems to be almost cosmopolitan, as it is known not only on both Atlantic shores but abundantly from California to Chile. It is one to two feet long, dark bluish above, sides silvery, with conspicuous dark stripes along each row of scales. A smaller, more thoroughly marine species, dark olive and without streaks, is the white mullet or liza blanca (*M. Curema*), numerous on both American coasts. Several other species are taken in the Gulf of Mexico and southward, one of which (*M. gyrans*) has the curious habit of swimming round and round at the surface in schools, and is called whirligig mullet.

(3) In the Mississippi Valley, several suckers (q.v.) of the family *Catostomidæ* are called mullets in reference to their mullet-like appearance and behavior.

Consult Günther, 'Study of Fishes' (1880); Goode, 'Fishery Industries,' sec. 1 (1883); 'American Fishes' (1888); Jordan and Evermann, 'American Food and Game Fishes' (1902).

MULLIGAN LETTERS, in American political history, a series of letters written by James G. Blaine (q.v.) to Warren Fisher, a business associate, which it was alleged proved legislative corruption upon the part of Blaine in the matter of bills in Congress concerning the Little Rock and Fort Smith and the Northern Pacific railroads. The letters were obtained by one James Mulligan, a clerk of Fisher, who appeared as a witness before a Congressional committee appointed to investigate Blaine. On 5 June 1876 Blaine secured these letters and read them before the House, after defying the committee to compel him to surrender them. The letters were freely used as campaign documents in the Presidential contests of 1876 and of 1884, by Blaine's enemies. Consult Peck, 'Twenty Years of the Republic' (New York 1906).

MULLINGER, mŭl'lĭng-gėr, **James Bass,** English historian: b. Bishop Stortford, England, 1834. He was graduated from Saint John's College, Cambridge, in 1866 and in 1881–83 was lecturer at Bedford College, London. In 1885–95 he was lecturer on history of education to the Teachers' Training Syndicate at Cambridge and in 1890–94 lecturer on ecclesiastical history at Trinity College, Cambridge, since when he has been librarian and lecturer in history in Saint John's College. He has published, among other works, 'Cambridge Characteristics in the 17th Century' (1867); 'The Schools of Charles the Great' (1876); 'The Age of Milton' (1897); 'History of Saint John's College, Cambridge' (1901); and wrote the article 'Popedom' for the ninth edition of the 'Encyclopædia Britannica.'

MULLION, *in architecture*, a vertical division between the lights of windows, screens, etc. The term is also applied to the division between the panels in wainscoting.

MULOCK, mū'lŏk, **Dinah Maria.** See Craik, Dinah Maria.

MULOCK, mū'lŏk, Sir **William,** Canadian educator and politician: b. Bond Head, Ontario, 19 Jan. 1844. He was graduated from the University of Toronto in 1863 and 1868 was admitted to the bar. He was first elected to the Parliament of Canada in 1882 and was vice-chancellor of the University of Toronto from 1881 until 1900 when he resigned. He was Postmaster-General of Canada from 1896 to 1905 and was instrumental in establishing the penny postal rate with other parts of the empire. He was Minister of Labor 1900–05. Besides his public duties he is connected with many large financial interests.

MULREADY, mŭl'rĕd-ĭ, **William,** Irish genre painter: b. Ennis, County Clare, 1 April 1786; d. London, 7 July 1863. He went to London while yet a child, and there his talent for art came under the notice of Banks, the sculptor, who assisted him in his education, and in 1800 he became a student of the Royal Academy, where he first exhibited in 1804. In 1806 appeared his 'Hampstead Heath' and in 1809 'Returning from the Ale House' and 'The Carpenter's Shop.' He was elected an associate of the Royal Academy in 1815, and to full membership in the following year, an honor won by 'The Fight Interrupted.' Although purely English in his education, subjects and general treatment, Mulready's pictures, in color and characteristic care of detail, have often suggested comparisons of him with the Dutch painters. While popular in character, his work never descends to the merely vulgar or sensational, his representations of common life being properly dignified by the fidelity and thoroughness of his art. Besides those already mentioned, his best known works include 'Giving a Bite' (1836); 'Snow Scene' (1842); 'Choosing the Wedding Gown' (1846); 'The Bathers' (1857); and 'The Wolf and the Lamb.' His illustrations to 'The Vicar of Wakefield' were very successful. Mulready became most widely known through the ornamental design which he furnished in 1840 for the postal envelope devised by Rowland Hill (q.v.). Nearly all of Mulready's best pictures are now the property of the English nation. Consult Stephens, 'Memorials of Mulready' (London 1867).

MULTAN, mool-tän', or **MOOLTAN,** India, an ancient city of the Panjab, capital of a district, 190 miles southwest of Lahore, and four miles from the present left bank of the Chenab. It is surrounded by a dilapidated wall, upward of three miles in circumference. It is an important railway centre. The principal manufactures are silks and fine cotton fabrics, while coarse cotton cloth is also produced for home consumption. Multan has an extensive foreign trade with the countries west of the Indus, and a large banking business is carried on by its merchants. The fortress built in 1640 stands to the north on a mound of earth on the site of the old city. The vicinity is covered with a vast quantity of the ruins of tombs, mosques and shrines. Many of these have been substantial edifices. The tombs of Bhawal Hakk, Shams i Tabriz and Rukn ul Alam and the Hindu temple of the Narasingh Avatar of Vishnu are the most important. There is an important cantonment one and one-half miles east of the city. Multan is one of the most ancient cities in India. It was taken by Mahmud of Ghazna in 1005; by Pir Mohammed for Tamerlane in 1398. After many vicissitudes it fell into the hands of the Sikhs, from whom it was taken by the British in 1849. Pop. 99,243.

MULTIPLE SERIES. See SERIES.

MULTIPLE STARS. See DOUBLE STARS.

MULTIPLICATION. See ALGEBRA, DEFINITIONS AND FUNDAMENTAL CONCEPTS; ARITHMETIC; MATHEMATICS.

MULTITUBERCULATA, a group of fossil mammals of small size, first appearing early in the Mesozoic and disappearing with the Paleocene. They were so called from the many tuberculated surfaces developed upon the molar teeth. They were reptilian and are considered the earliest of the mammals, and were probably egg layers. Little is known of the structure of these animals except as to the lower jaws and teeth. The character of these last had suggested that these forms belong near the Monotremata (q.v.) in the sub-class Prototheria (q.v.). The propriety of the term and the characteristics of the group are discussed by Beddard, in 'Mammalia' (1902).

MUMBO JUMBO, an African (Mandingo) superstition; a bogie, hideous and malignant, who is the terror of negro women and children.

MUMFORD, James Gregory, American physician: b. Rochester, N. Y., 2 Dec. 1863; d. 1914. He was educated at Saint Paul's School, Concord, N. H., and was graduated (1885) at Harvard and received the M.D. diploma (1890) from the Harvard Medical School. He started medicine and surgery practice at Boston in 1890, was appointed (1892) surgeon to Carney Hospital and (1894) to out-patients of the Massachusetts General Hospital. He served successively as assistant in surgery (1895) and instructor in surgery (1902) at Harvard Medical School, and became (1905) visiting surgeon of the Massachusetts General Hospital. He wrote 'Narrative of Medicine in America' (1903); 'Clinical Talks on Minor Surgery' (1903); 'Surgical Aspects of Digestive Disorders' (1905), besides contributing numerous articles to the surgical and medical periodicals. He wrote the introductory article on 'History of Surgery' for Dr. W. W. Keen's 'System of Surgery.'

MUMMICHOG. See KILLIFISH.

MUMMIUS, mŭm'ĭ-ŭs, **Lucius,** Roman consul: flourished about 185–130 B.C. He served as prætor in Spain in 146 B.C., conquered Greece, where he burned and pillaged her finest cities, sending the art treasures of Corinth to Rome. According to Cicero, he did not retain any of the plunder. He was made governor of Achaia with the surname Achaicus, and a triumph was held in his honor. In 141 he was re-elected consul. He later became a censor, but of his last years and death little is clearly known.

MUMMY (Arab. *mumia*), specifically a dead body preserved from putrefaction by embalming with bitumen or other asphaltic substances. The wider use of the term includes bodies preserved in a dry state by any process. The custom of thus preserving the bodies of the dead has prevailed in several countries. Humboldt found mummies in Mexico, and in Peru the bodies of the Incas were rudely embalmed and dried. The Guanches, or aboriginal inhabitants of the Canaries, removed the entrails of the dead, dried the corpse in the air, covered it with aromatic varnish and, wrapping it in goat skins, kept it in a wooden case. These mummies, of which thousands have been found, are light in weight, of a yellow color and have a strong aromatic odor. But it was among the ancient Egyptians that the art and practice of embalming the dead were carried to the greatest extent and highest perfection. From Egypt the practice spread southward along both coasts of Africa and to India, Malaysia, Polynesia, Australia and Arabia. On the Western Continent it reached Peru, Colombia and Mexico and also Alaska. In the last-named country it may have been sporadic for it was first in vogue there about 1720. All the dead of Egypt, including many animals, were embalmed in some manner, partly, it is supposed, from religious motives and partly for sanitary reasons. The notion formerly prevalent that the Egyptians preserved the body in order to keep it in a fit state to receive the soul when it should have passed through its allotted transmigrations is inconsistent with the facts that tombs were sometimes sold to later occupants. The origin of embalming among the Egyptians has been attributed to their first merely burying in the sand, impregnated with natron and other salts, which dried and preserved the body, which natural process they afterward imitated, drugs and bitumen being later improvements. Comparatively few mummies of children have been discovered in Egypt, though even those just born were embalmed. Embalming was practised by the Hebrews to some extent. Joseph commanded the physicians to embalm his father and in the time of Christ it was «the manner of the Jews» to bury the body «wound in linen cloths with spices.» The practice continued in Egypt from 4500 B.C. till the 7th century, and was common among the Greeks there, and even among the early Christians. It seems to have fallen gradually into disuse. See also EMBALMING; EGYPT. Consult Meany, E. S., ‹Alaskan Mummies› (Seattle 1906); Pettigrew, J. J., ‹A History of Egyptian Mummies› (London 1834); Smith, G. E., ‹The Migration of Early Culture› (Manchester, England, 1915).

MUMMY WHEAT, a variety of wheat said to have been produced from grains found in an Egyptian mummy, but there is no good reason to believe the legend. It has long been in general cultivation in Egypt and neighboring countries in Africa. The spike is compound

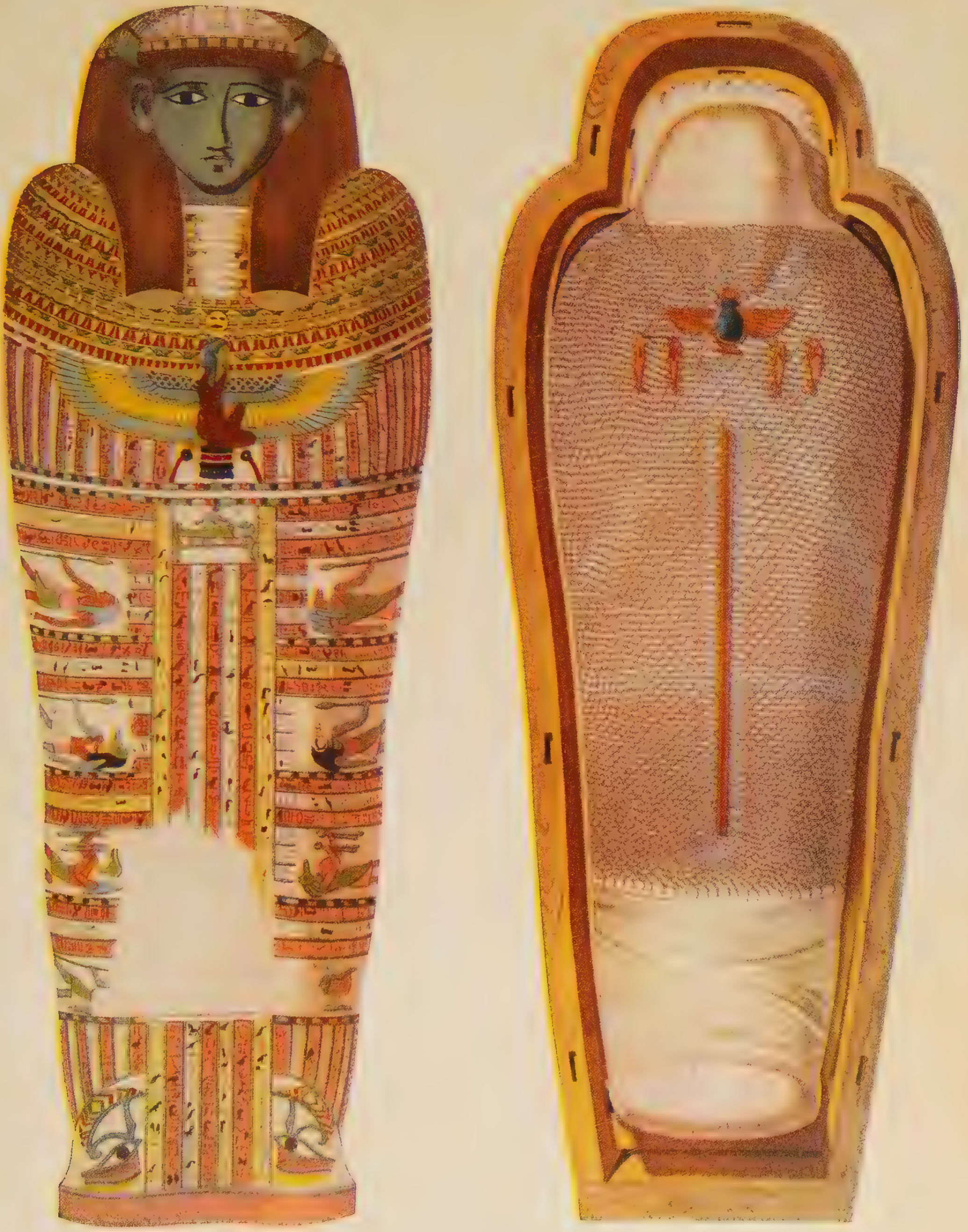
MUMPS, a popular name for a contagious epidemic inflammation and enlargement of one or both parotid salivary glands, occurring usually in youth, males being more frequently affected than females. In some localities it disappears for years, in other places it is endemic. Epidemics usually occur in the spring or fall. One attack generally gives immunity. The period of incubation is from 7 to 20 days. The disease is sometimes preceded for a few days by malaise, loss of appetite, irritability and feverishness. Its onset is marked by stiffness and pain about the jaws, followed by heat, pain and swelling about the lobe of the ear, earache and tinnitus aurium, fever (100°–104° F.), more or less rigidity of the neck, with distortion of the side of the head and difficulty in chewing, swallowing and talking. The inflammation is usually at its height by the third day of the disease, and the disease has subsided generally by the 7th or 10th day. Very seldom is there any suppuration of the affected gland. In some cases the subsidence of the gland inflammation is followed by pain and swelling of the testes of the male, and of the ovaries, vulva and breasts of the female, the complication being more common in males than in females. Occasionally a meningitis supervenes. Not infrequently a middle ear catarrh follows, leading to total deafness. The term mumps is sometimes applied to a parotiditis following a local injury, diseases of the mouth, diphtheria, occlusion of the salivary duct by a foreign body, etc. There is a secondary symptomatic or metastatic form of mumps which sometimes follows dysentery, scarlet fever, small-pox, measles, etc. The parotid gland in this form of mumps tends to suppurate. The best treatment for mumps consists in rest, preferably in bed, the giving of saline laxatives and soft food, relieving the fever, and securing sleep by mild remedies and keeping the face warm with flannel or some other agreeable application. In cases of slow convalescence tonics should be given.

MUN, mĕn, **Albert,** COUNT DE, French politician: b. Lumigny, Seine et Marne, 23 Feb. 1841; d. 1914. He was graduated (1862) at Saint Cyr, and entered the army and fought in the Franco-Prussian War (1870–71), to become a captain and ordnance officer of the governor of Paris. He devoted himself to the Ultramontaine party and founded the Catholic Labor Circles. Owing to the complaints of the Liberals concerning such activities on the part of an officer he resigned (1875) his commission and, with the aid of the Clerical party, was elected (1876) as deputy. He took his place among the extreme «Rights,» representing both Church and monarchy. He led mass-meetings to agitate for the union of Church and State and social reform in the Catholic sense. In 1897 he was made member of the Academy. In 1913 he advocated the abolition of the Three-Year Military Law, but when war broke out next year his eloquent oratory was exerted exhorting his fellow-citizens to show courage and persistence. His speeches were issued in collective form (Paris 1888–1904) in seven volumes. He wrote ‹Les congrégations réligieuses devant la Chambre› (1903); ‹Contre la séparation› (1905); ‹L'heure décisive› (1913).

MUN, Thomas, English merchant and political economist: b. London, England, June 1571; d. there, July 1641. He engaged in mercantile business when very young, was interested in the Mediterranean trade and in 1615 was a director of the East India Company. As a writer on economics he presents really the first clear and systematic treatment on the subject and his is admitted to have been of great influence. He published ‹A Discourse of Trade, from England into the East Indies,› in 1621, and his greatest work, ‹England's Treasure by Foreign Trade,› was published posthumously in 1664.

MUNBY, Arthur Joseph, English poet: b. Bulmer, Yorkshire, England, 22 Aug. 1828; d. Ripley, Surrey, 29 Jan. 1910. He was graduated at Trinity College, Cambridge, in 1851, and was admitted to the bar of Lincoln's Inn in 1855. He was the author of ‹Verses Old and New,› which contains the much admired pastoral poem ‹Doris› (1865); ‹Dorothy› (1880), which has been widely circulated in the poet's own country and in America; ‹Vestigia Retrorsum› (‹Steps Backward,› 1891); ‹Vulgar Verses, by Jones Brown› (1891), mostly in dialect; ‹Susan› (1893); ‹Ann Morgan's Love› (1896); ‹Poems, Chiefly Lyric and Elegiac› (1901); ‹Relecta› (1909).

MUNCH, moonн, **Peter Andreas,** Scandinavian historian: b. Christiania, Norway, 15



CASE AND MUMMY IN ITS CEREMENTS

Dec. 1810; d. Rome, 25 May 1863. He was educated at the University of Christiania and studied deeply the old Norse language and antiquities. In 1841 he was appointed professor of history at the University of Christiania. He was accorded the unusual privilege of access to the papal archives in Rome, where he spent much time in study. His principal work is ‹History of the Norwegian People› (1852–63). Munch published several works of a linguistic character, and, repudiating the term «Icelandic,» maintained that the so-called Icelandic literature was really Old Norse. He also translated several of the Old Norse sagas. A collection of his essays was edited by Gustav Storm (1873–76).

MUNCH, Peter Andreas, Norwegian poet: b. Christiania, 19 Oct. 1811; d. near Copenhagen, 27 June 1884. He was originally a student of law, but became an editor (1841–46) and professor in the university (1866) at Christiania. Among his writings are ‹Sorg og Trost› (‹Grief and Consolation›), of which seven editions have been printed; ‹Ephemera› (1836); ‹King Sverre's Youth› (1837), a drama; ‹The Singer› (1838); ‹Poems Old and New› (1848); ‹Pictures from North and South› (1848), in prose; ‹New Poems› (1850); ‹Lord William Russell› (3d ed., 1888), a tragedy, and ‹An Evening at Giske› (1855), a historical drama. Munch translated into Norwegian many works from such authors as Tennyson and Walter Scott, and wrote some popular Norwegian songs.

MÜNCH-BELLINGHAUSEN, münk-bĕl′-lĭng-how′zĕn, **Eligius Franz Joseph,** FREIHERR VON, also known under the pseudonym FRIEDRICH HALM, Austrian dramatist and short-story writer: b. Krakau (Cracow), 2 April 1806; d. Vienna, 22 May 1871. He came to Vienna in 1811 and began studying law there in 1822, making the acquaintance while a young student of such prominent literary men as Bauernfeld, Lenau, Seidl, etc. In 1826 he entered the employ of the Austrian government as a lower official and remained in the bureaucracy from that time until his death, his chief positions being custodian (later director) of the court library and general superintendent of the Vienna Hofburgtheatre. As a dramatist, Halm's position in German literature is that of a constructor of correct dramatic outlines, often banal in their conventionality, which are always surrounded with resounding rhetoric and a peculiar union of romanticism and pessimism, together with occasional real feeling. His first play, ‹Griseldis› (1835) had a great stage success and passed over most of the stages of Germany. There followed a number of less successful productions: ‹Camoens› (1837); ‹Adept,› tragedy (1838); ‹Imelda Lambertazzi,› tragedy (1842). His greatest success and his best-known play is ‹Der Sohn der Wildnis› (1842; known on the English stage as ‹Ingomar›), although ‹Der Fechter von Ravenna› (1857) also was very popular. Of his short stories the best are ‹Die Marzipanliese› and ‹Das Haus an der Veronabrücke.› His works have been published: ‹Werke› (8 vols., Vienna 1856–64; 4 additional vols., 1872); ‹Ausgewählte Werke› (4 vols., Leipzig 1904: another ed. by Bong, Berlin 1910). Consult Schneider, ‹Friedrich Halm und das spanische Drama› (Berlin 1909); Schachinger, R., ‹Briefwechsel zwischen M. Enk und Halm› (Wien 1890); Pachler, F., ‹Die Jugendjahre Halms› (Wien 1877).

MÜNCHEN (mün′hĕn) **GLADBACH.** A town in the Prussian Rhine province.

MÜNCHHAUSEN, münh′how-zĕn, **Hieronymus Karl Friedrich,** BARON: b. Bodenwerder, Hanover, 1720; d. there, 1797. He was a German soldier and served in his youth as a cavalry officer in the Russian army. He was possessed of an adventurous and dare-devil spirit and an imagination that knew no bounds. He told the most wonderful stories of his adventures in the Turkish campaign of 1737–39, and soon became famous as the most unique exaggerator that ever lived. The tradition of the baron's story-telling is supported by the evidence of a clergyman, who says that in his old days the officer used to relate his most surprising adventures «in a cavalier manner, with a military emphasis, but without any passion and with the easy humor of a man of the world, as things which required no explanation or proof.» His tales are thought to have been first compiled by Rudolf Erich Raspe, a man of letters, who, being compelled to flee from his position as curator of the museum at Cassel to England on account of a charge of embezzlement, was engaged in London in literary pursuits, and is generally believed to have published anonymously an English edition of the stories under the title of ‹Baron Münchausen's Narrative of his Marvelous Travels and Campaigns in Russia› (1785). A second edition, enlarged and ornamented, was published at Oxford in 1786 under the title of ‹The Singular Travels, Campaigns, Voyages and Sporting Adventures of Baron Munnikhouson, commonly pronounced Munchausen; as he relates them over a bottle when surrounded by his friends.› A third edition, published by Kearsley in London the same year, bore the title of ‹Gulliver Revived.› The story passed through many editions by different hands, gaining more and more accretions each time, whether in form of borrowings from Lucian or of topical «hits» on Baron de Tolt, Montgolfier, the first balloonist, or Bruce, the explorer of the Nile. One of the best editions is that by Shore (1872), illustrated by Doré, with additions by Theodore Gautier. It is said a large proportion of the hunting tales are derived from Henry Bebel's ‹Facetiæ› (1508), while other incidents are borrowed from Castiglione's ‹Cortegiano› and Bildermann's ‹Utopia,› which are included in Lange's ‹Deliciæ Academicæ› (1765). Consult Müller-Fraureuth, ‹Die deutschen Lügendichtungen auf Münchausen› (1881). See ADVENTURES OF BARON MÜNCHAUSEN, THE.

MÜNCHHAUSEN: A Story in Arabesques: a satirical romance by Karl L. Immermann (q.v.) originally published in four volumes in Düsseldorf during 1838–39. The eponymous hero is presented as the nephew of the famous prevaricator, while the author has also taken at least a part of his ideas from ‹Don Quixote› in attaching to the hero a droll serviteur who closely resembles the materialistic Sancho Panza. Other influences are traceable in the work, notably of Rückert's translation of Hariri's ‹Makamen,› Swift's ‹Gulliver's

Travels' and 'Gil Blas.' The story may be described as a formless mass of episodes played in Westphalian villages. The «New Münchhausen» is a traveller like Humboldt; like Gulliver, he sojourns among and converses with animals; like Gil Blas he serves as kitchen boy; like Cagliostro he lives indefinitely on rejuvenating medicine. He appears in different rôles, and in each character successfully exploits the credulity of his audiences. As a disinterested financier and company promoter he is eminently and humorously successful.

MUNCIE, mŭn'sĭ, Ind., city, county-seat of Delaware County, on the White River, and on the Central Indiana, the Lake Erie and Western, the Cleveland, Cincinnati, Chicago and Saint Louis, the Chesapeake and Ohio of Indiana, Fort Wayne, Cincinnati and Louisville and other railroads, about 56 miles northeast of Indianapolis. There are six interurban lines. A belt railway encircles the city and furnishes intercommunication among the lines which enter the city. Muncie is situated in an agricultural region and in a natural-gas belt. The chief manufacturing industries are iron and steel works, glass works, machine shops, canneries, pulp and paper mills, manufactories for silver and silver-plated goods, wagon and carriage works and flour mills, automobiles and automobiles parts, motors, pianos, toys and gloves. Other articles manufactured are gas-engines and gas fixtures, knit underwear, glass-jars, lawn mowers, silverware, wheels, boilers, iron bedsteads, caskets and undertakers' supplies. There is a large trade in the manufactures of the city, and in coal, farm products and livestock. The city is the seat of the Eastern branch Indiana State Normal Institute. The city has good public and parish schools, good modern high school, a public library which has over 35,000 volumes, a city hospital, courthouse and a number of fine churches. The government building cost over $80,000 and the public library building $50,000. The present form of city government is on the Federal plan, consisting of a Mayor and aldermen elected under the ward system and with the usual executive branches. Pop. (1920) 36,524.

MUNDE, mŭn'dĕ, **Paul Fortunatus**, American gynecologist: b. Dresden, Saxony, 7 Sept. 1846; d. New York, 7 Feb. 1902. After coming to the United States in 1849 he attended the Boston Latin School and then studied medicine at Yale. He left before completing his course, entering the Union army as medical cadet in 1864. He was afterward graduated from the Harvard Medical School in 1866 and went to Germany, where he enlisted in the Bavarian army. He was decorated by the emperor with the Iron Cross for heroism in saving the lives of patients from a burning hospital near Paris. After devoting himself to study and practice in hospitals in Berlin, Heidelberg, Paris, London and Edinburgh he took up his residence in New York in 1873, and practised obstetrics and gynecology. He was appointed professor at Dartmouth Medical College and in the New York Polyclinic in 1882. He edited (1874–92) the *American Journal of Obstetrics*, and was president of the American Gynecological Society in 1897–98. Among his works are 'Minor Surgical Gynecology' (1880); 'Appendix to the Midwifery of Cazeaux and Tamier' (1884); 'Pregnancy and the Puerperal State' (1887), and 'Diseases of Women' (1891).

MUNDELEIN, George William, American Roman Catholic archbishop: b. New York, 2 July 1872. He studied first at the De La Salle Institute and later at Manhattan College, after which he began his theological course at Saint Vincent's Seminary, Beatty, Pa., completing it at the Urban College of the Propaganda in Rome. Ordained to the priesthood in Rome 8 June 1895, he became assistant secretary to Bishop McDonnell of Brooklyn, N. Y., being appointed diocesan chancellor in 1897, which office he held for 12 years. In 1903 Father Mundelein was named censor of the Liturgical Academy; in 1906 was elevated to the rank of domestic prelate and in 1908 received from the Propaganda the degrees of licentiate of sacred theology and doctor of divinity. Monsignor Mundelein was consecrated titular bishop of Loryma and auxiliary bishop of Brooklyn 21 Sept. 1909 and on 15 Dec. 1915 was promoted to the archiepiscopal see of Chicago, receiving the pallium at the hands of Archbishop John Bonzano, Apostolic Delegate to the United States, 9 Feb. 1916. Archbishop Mundelein is a distinguished liturgist and theologian and a linguist of marked ability and as metropolitan of the ecclesiastical province of Chicago is shepherd of over 1,150,000 souls.

MÜNDEN, mün'dĕn, Prussia, town in the government district Hildesheim, located on the confluence of the Werra and Fulda with the Weser. It is the junction of the Hanover-Elze-Cassel and the Nordhausen-Münden state railways. The neighborhood has romantic forests and contains two Lutheran churches, the Blasükirche dating from 1263 has a monument to Erich II of Brunswick, besides a Catholic, a Reformed church and a synagogue. There are also an ancient castle with a museum, an Imperial academy of forestry, a gymnasium, a realprogymnasium, etc. Its industries include rubber works, wooden and lead ware, leather, tobacco and cigar factories, also factories producing cellulose, artificial manures, glass-paper, a sugar refinery, boiler factory, etc. Considerable commerce is carried on in lumber and shipping. In 1910 it had 10,991 inhabitants.

MUNDT, moont, **Klara Müller** («Mühlbach, Luise»), German novelist: b. Neubrandenburg, January 1814; d. Berlin, 26 Sept. 1873. She was married to Theodor Mundt (q.v.) in 1839. She was an extremely prolific writer of popular historical novels, which though quite without merit in point of style are by no means wanting in descriptive excellence. They were all published under the pen name of «Luise Mühlbach» and have had as many eager readers in this country and England as in the writer's own land. Among them are 'Queen Hortense' (5th ed., 1861); 'Emperor Joseph II and his Court' (9th ed., 1866); 'Marie Antoinette and her Son' (1867); 'Emperor Alexander and his Court' (1868); 'Mohammed Ali and his House' (1871); 'Frederick the Great and his Court' (8th ed., 1882).

MUNDT, Theodor, German author: b. Potsdam, Prussia, 19 Sept. 1808; d. Berlin, 30 Nov. 1861. He was the husband of Luise Mühlbach. He studied at the University of

Berlin, and in 1842 became privat docent there. In 1848 he was appointed professor of literature and history at the University of Breslau, and in 1850 was recalled to Berlin as university librarian and professor. He belonged to the «Young German» school, was a Radical in politics and favored the emancipation of women. His writings include ‹Madonna, Unterhaltung mit einer Heiligen› (1840), a memoir of Charlotte Stieglitz; the novels, ‹Thomas Münzer,› ‹Carmela› (1844); ‹Mendoza, der Vater der Schelme› (1847); ‹Die Matadore› (1850); the critical and historical works, ‹Kunst der Deutschen Prosa› (1837); ‹Geschichte der Gesellschaft›; ‹Geschichte der Weltliteratur›; ‹Geschichte der Literatur der Gegenwart› (1852); and political sketches included in ‹Pariser Kaiserskizzen› (1856); ‹Paris und Louis Napoleon› (1858); ‹Italienische Zustände› (1859–60). He also published Luther's ‹Politische Schriften,› and with Varnhazen von Ense edited Knebel's letters and posthumous works.

MUNGER, Theodore Thornton, American Congregational clergyman: b. Bainbridge, N. Y., 5 March 1830; d. 12 Jan. 1910. He was graduated at Yale in 1851, and at Yale Theological School in 1855. He held pastorates at Dorchester, Mass., 1856–60; Haverhill, Mass., 1862–70; Lawrence, Mass., 1871–75; San José, Cal., 1875–76. He was for several years pastor at North Adams, Mass.; resigning in 1885 to become pastor of the United Church, New Haven, Conn. He was prominent in his denomination as well as an active supporter of municipal reform. He published ‹On the Threshold› (1880); ‹The Freedom of Faith› (1883); ‹Lamps and Paths› (1883); ‹The Appeal to Life› (1887); ‹Horace Bushnell› (1899); ‹Character Through Inspiration›, etc. Consult Bacon, B. W., ‹Theodore Thornton Munger, New England Minister› (New Haven 1913).

MUNGO, Saint, or KENTIGERN, the patron saint of Glasgow: b. Culross, about 518; d. Glasgow, 13 Jan. 603. He was baptized and brought up by Saint Serf, the head of a monastery at Culross. His name, Kentigern or Cyndegyrn (from *ken* and *tigearna*), means head lord, and it is said that it was exchanged by the brethren of the monastery for Mungo, the beloved, on account of the affection they bore him. On leaving Culross Kentigern took up his abode as a missionary priest near the site of the present Glasgow. Here he was chosen bishop, but having troubles with the king of the Strathclyde Britons afterward took refuge at Saint David's in Wales, and while in that region founded a religious establishment under a follower named Asaph, which afterward became the seat of the bishopric of Saint Asaph. Redderech, king of the Strathclyde Britons, recalled him to Glasgow, where he acquired a character of great sanctity. The city arms of Glasgow are associated with various legends concerning Saint Mungo, and the cathedral is supposed to be built on the site of his monastery. The parish of Saint Enoch, in Glasgow, is so called from a corruption of his mother's name (Theneu). A life, written by Jocelyn of Furness about 1180, was published in Pinkerton's ‹Vitæ Antiquæ Sanctorum Scotiæ.› Consult Rhyr, J., ‹Celtic Britain› (London 1904); Skene, ‹Celtic Scotland› (Edinburgh 1877).

MUNGOOS, or MONGOOSE, an ichneumon (*Herpestes griseus*), common in many parts of India, and closely akin to the Egyptian species ichneumon (q.v.). The mungoos is a burrowing, nocturnal, weasel-like animal, tawny yellowish-gray, 16 or 17 inches long, and with a long thick terete tail. It kills numerous birds, sucking their blood and leaving the body uneaten. It also with great adroitness seizes and kills many snakes, the formidable cobra included, usually avoiding the serpent's stroke by its quickness. Its excitement and ferocity in these encounters is almost indescribable. It is, however, commonly domesticated as a mouser in the Orient, and has been colonized in various parts of the world to destroy vermin, usually with sad results; hence the bringing of a living one into the United States has been forbidden by law since 1902. This animal was introduced into Jamaica and some other islands of the West Indies about 1872, and later in Hawaii, in the expectation that it would overcome the plague of rats in the sugar plantations. It did so, but it multiplied excessively, killed off poultry and insect-eating birds, reptiles and mammals, which were useful. Many of these animals changed their habits somewhat to accommodate themselves to the novel enemy, and the mungoos does not now multiply so rapidly as at first, and does less damage. The same experience was had elsewhere, and has warned other countries to avoid a repetition of it. Consult Blanford, ‹Fauna of British India; Mammals› (1889); Morris, ‹The Mungoos on Sugar Estates in the West Indies› (London 1884); and *The Field* (London, 13 July 1895); Lyddeker, Richard, ‹Royal Natural History› (London 1896); ‹Cambridge Natural History› (New York 1904 et seq.).

MUNICH, mü'nik, or **MÜNCHEN,** mün'hĕn, Germany, the capital of Bavaria, one of the most beautiful cities in Europe, lies on an extensive but uninteresting plateau, about 1,700 feet above sea-level, on the left bank of the Isar, with suburbs on the right, the river being crossed by nine bridges. The original nucleus of the town was at one time surrounded by walls and ditches, and entered by lofty turreted gates. The ditches have been filled up and the walls removed, but three of the old gates, with their loopholed and embattled flanking towers, still remain. In the older part of the town there are many old houses, irregular both in size and form, and of quaint but not unpicturesque architecture. This quarter, though it contains the government offices and many public edifices, is surpassed, both in extent and magnificence, by the new town, which has risen chiefly to the north and west, with almost unexampled rapidity and splendor, due to the art-loving proclivities of King Ludwig I and his successors, who spent over 7,000,000 thalers in beautifying the city, and adorning it with buildings of almost every style of architecture, wide and handsome streets, and squares and gardens decorated with statues and other monuments. Near the centre of the city, between the Max-Joseph-Platz and the palace gardens, is the royal palace, consisting of an old central building of vast extent and two modern wings. From this great pile run at right angles to each other the two finest streets in Munich — the Maximilianstrasse and the Ludwigstrasse. The chief public buildings are the old town-house and the new, the latter in the Gothic style, considerably enlarged in 1899; the old palace and the Herzog Max Burg, now used as public offices; the post office; the central station (1880); the chief customs house (1876–79); and the new palace of justice (1897). Buildings connected with art embrace the gallery of sculpture, or Glyptothek, an edifice of the Ionic order, containing a series of the finest ancient and modern sculptures; the Old Pinakothek or picture-gallery (1826–36) another beautiful edifice, containing one of the richest collections of pictures in the world; the New Pinakothek, adorned externally with frescoes and containing only paintings by recent masters; the academy of arts, an imposing building in the renaissance style; the academy of the plastic arts (1885); the Schack Gallery of paintings (1894), named from its donor; the Schwanthaler and Kaulbach museums, etc. The Crystal Palace (1854) is used for the annual art exhibitions. Other collections are the Hof-und-Staats Bibliothek, with 1,100,000 printed volumes and over 50,000 MSS.; the old Bavarian national museum, now used for art collections; the new Bavarian national museum (1899), etc. The German Museum is in all probability the finest museum of technology and the physical sciences in the world. The chief theatre is the Royal and National Theatre, with a lofty Corinthian portico. Munich is rich in monuments, which adorn its squares, gardens and public promenades. Among the chief are the monument of Maximilian II, with his statue 26 feet high, and the colossal bronze statue of «Bavaria,» 65 feet high. It is a hollow female figure, designed by Schwanthaler and cast from foreign cannon. From the head a fine view of the city and the Alps is obtained. It stands on a low eminence in front of the «Hall of Fame,» a Doric building of horse-shoe shape, containing busts of notable Bavarians. The «Gate of Victory,» in imitation of the arch of Constantine at Rome, and the Propylæa, in imitation of that at Athens, should also be mentioned. There is a fine statue of Maximilian I by Thorwaldsen, and statues of Schiller, Gluck, Schelling, Fraunhofer and Gärtner, a bronze monument to the Bavarian soldiers who died in the war with Russia and a monument to the chemist Liebig. The Hofgarten is a garden near the palace, finely planted, and surrounded by an open and richly ornamented arcade; the so-called English Garden is an extensive and beautiful park. The cemeteries of Munich are noteworthy for their artistic tombs, probably the most beautiful in Europe. The ecclesiastical buildings, include the cathedral or Frauenkirche, founded in 1488, a vast pile, entirely of brick, with two lofty towers, terminating in domes 333 feet high; Saint Michael's or the Jesuits' Church (1583), a handsome Italian structure; the church of the Theatines, another Italian structure, beneath which are the burial vaults of the royal family; the church of Saint Louis, a modern building of brick, faced with white marble, decorated externally with statues by Schwanthaler, and internally by the finest frescoes of Cornelius; the church of All Saints; the basilica or church of Saint Boniface; the Mariahilf church on the right side of the river; the three Protestant churches; and the Jewish synagogue. At the head of the educational institutions is the university. (See MUNICH, UNIVERSITY OF). Closely associated with it are the university library with 600,000 volumes and 2,500 manuscripts, together with 3,000 incunabula; the Collegium Georgianum (1494), a priests' seminary; the Maximilianeum (1852), etc. There is also a high school of technology and numerous other high class institutions for educational purposes. The industrial development of Munich lags behind its æsthetic development. Its stained-glass works, iron, brass and bell foundries, lithographing and engraving works and manufactories of optical and mathematical instruments and various artistic articles, are, however, deservedly noted. Still more famous are the enormous breweries of Bavarian beer, which annually produce about 49,000,000 gallons, of which 37,000,000 are consumed in the city itself. The brew-houses and beer-gardens are world famous. Munich carries on a large trade in grain and in objects of art.

In 1158 Henry the Lion raised the *Villa Munichen* from its previous obscurity by establishing a mint and a salt-emporium within its precincts, the name (also appearing as *Forum ad Monachos*) being derived from the monks who owned the site. In the 13th century the dukes of the Wittelsbach dynasty selected Munich for their residence and fortified the town. In 1327 the old town was nearly destroyed by fire, and was rebuilt by the Emperor Louis the Bavarian; it was not until the fortifications were razed at the close of the 18th century that the limits of the town were enlarged to any extent. The true history of modern Munich is the account of its artistic development in the 19th century, closely identified with which are Klenze and Gärtner the architects, Schwanthaler the sculptor, Cornelius and Kaulbach, the painters, and Wagner the composer. The modern Munich school of painting, headed by K. von Piloty, W. Diez and Grützner, is characterized by marked realism in color and detail, in contrast to the romanticism of the older masters. The elevated site of the city and the neighborhood of the Alps render it liable to sudden changes of temperature, sometimes ranging over 20° in 24 hours. The population in 1801 was only 48,885; in 1915 it was 630,000; from 30.4 per thousand in 1871 the deathrate fell to 20.5 in 1904.

The university, the Academy of Fine Arts, and the Conservatory of Music, under the leadership of men of world-wide reputation, and the splendid facilities of the city in its theatres, museums and galleries, its handsome buildings and healthful location, attract thousands of visitors to Munich every year.

The municipal budget of Munich is about $4,500,000. The debt is not far from $40,000,000, but the city has almost twice the sum invested in public property. The city is governed by 2 burgomeisters, 40 magistrates and about 70 councilmen.

MUNICH, University of, German university, located in Munich, Bavaria. It had its beginning in the Studium Generale of Ingolstadt, founded by the Emperor Ludwig, with a special bull of approval by the Pope, Pius II, in 1459. The University of Ingolstadt opened its doors in 1472; and after more than three centuries of continuous struggle and growth, and during which time it remained in the faith and under the influence of the Church of Rome, it was removed by Ludwig Maximilian in 1800 to Landshut. In 1826 it was reorganized and transferred to Munich, where with increased facilities it has grown steadily in attendance and influence. The university has faculties of theology, law, medicine, philosophy, political science, etc., and numerous seminars and clinics, a botanical garden, museums, laboratories and an observatory; and has access to the libraries, museums and art treasures of the city. The university library contains 600,000 odd volumes, besides many manuscripts, pamphlets and records. The professors and instructors number more than 200 and more than 7,500 students are in average attendance. The annual income averages $250,000, in large part contributed by the government. Affiliated with the university are the Collegium Georgianum, for the education of Roman Catholic priests, founded in 1494, and the Maximilianeum, a secondary school, founded in 1852.

MUNICIPAL ACCOUNTING IN THE UNITED STATES. **Definitions.**— The term «municipality,» when used herein, is a generic designation of all public corporations formed by or for a community with powers of local government, by whatever name or designation known in the several States of the Union. Chief Justice Marshall defined a municipal corporation as «such only as is founded by the government for public purposes where the whole interests belong to the government.» «Municipal accounting» is the adaptation or application of generally recognized principles and methods of accounting to the conditions, business and requirements of municipalities — the art or science of analyzing, classifying, recording, summarizing and elucidating facts relative to financial transactions.

Objects of Municipal Accounting.— Its function or purpose is to make possible the production, from the accounts of a municipality, of complete, accurate and prompt information and statements of the financial results of its operations for any given period and of its financial condition at any given time, and to supply all other information which accounts can supply for the orderly and prosperous administration of municipal affairs.

Like accounts of private affairs, a municipality's accounts should provide the data for thinking about the business at hand, the development of plans, the determination of policies and the judgment of results. If a municipality's accounts comply with these requirements, two aims will be satisfied: (a) administrative officers will be aided in performing their duties and in executing the trust imposed upon them, and (b) the public can pass intelligent judgment as to the fidelity, efficiency and economy of their chosen officials.

Similarity between Private and Municipal Accounts.— The thought is not infrequently expressed that municipal accounting differs widely from private accounting; that each in itself constitutes a separate science bearing little or no relation to the other. That thought is a fallacy. There is no difference in purpose, method or principle between private and public accounting. The distinguishing features of each, which are sometimes thought to be fundamental differences, relate only to the subjects concerning which information is needed. For instance, municipalities seldom, if ever, engage in business for profit. They exist to render service at cost. Hence profit and loss accounts are uncommon. On the other hand, individuals, partnerships and private corporations are not subject to the special limitations placed upon the administrative action of municipal officers by the terms of appropriation acts and legislation generally, and, hence, they seldom maintain appropriation accounts. But these variations should not conceal or obscure the fact that the principles and rules of municipal and private accounting are identical. Furthermore, since municipal business may be administered economically or improvidently, or efficiently or inefficiently, and thereby affect the interests of its proprietors directly by limiting the service rendered or increasing service cost, there is as much necessity of applying accounting principles to municipal business transactions as to private affairs of the same nature.

History.— It is not known just when and where municipal accounting originated. Reliable authorities disclose that the Athenians maintained a rather well-developed system. Rome's plan was based upon and adhered closely to the system employed in private business of the time. Great Britain, from which municipal accounting methods in this country were very largely borrowed, copied or adopted, is said to have had a system as early as the 12th century.

Prior to the 16th century, little if any thought or attention was given to the permanency of accounting records. That was true of private as well as of public accounts. When a transaction was concluded and the account closed, the record was thought of no value and was destroyed. The history of municipal accounting in the United States may, for the purpose of discussion, be divided in three eras. Naturally, no sharp line of demarcation separates them; nevertheless, they stand out with sufficient clarity and are as follows:

(1) The period from the settlement of the country to and including the decade immediately following the close of the Civil War. Within that epoch, accounts of municipalities were maintained, with few, if any, exceptions, merely to show the flow of cash into and out of the municipal treasury. It may with propriety be characterized as the age of «receipt and disbursement» accounting.

(2) The last quarter of the 18th century. Within that series of years public thought in relation to better processes of accounting for municipalities quickened. Serious consideration was by no means universal. The efforts were sporadic rather than general, but at the close of the century sentiments had, to a considerable degree, crystallized and in a general way the movement assumed measurable success and tangible form. It is, for the lack of a better term, characterized as the period of «awakening.»

(3) The third epoch comprises the first 18 years of the 20th century. Within those years rapid and substantial progress was made in securing, in a great number of municipalities, decided and materially improved methods of accounting developed along comprehensive, logical lines. The period of «accomplishment» is a suitable designation for that time.

Development.— In England, no impetus characterized the action toward municipal accounting reform until at or near the middle of the 19th century, and it was some years later before energetic thought and attention was addressed to the subject by or on behalf of American municipalities. And then the movement was tardy, inactive, sluggish. The principal reasons which contributed to the attitude of indifference and retarded the development of the work in this country are as follows:

(a) The country was relatively new, the population very largely rural, the form of organization comparatively simple, the scope of municipal activity exceedingly narrow, the tax rates insignificant when compared with present-day standards and accounts matters of indifference.

(b) Absolute necessity — the mother of invention and progress — did not force attention to the desirability of better methods. Improvement in private accounting methods did not develop of its own volition nor was it prompted by the unstimulated energy of those engaged in keeping private business accounts. It was forced on them. Competition and strife in every line of business endeavor made it imperative that the head of a business enterprise should have available every essential financial fact concerning the business. To fail to have it resulted in the loss of funds or, frequently, the bankruptcy of the concern. The compelling need which business experienced did not affect municipalities in the same way. They could not become insolvent. If their officers were wasteful, extravagant or inefficient and the treasury was emptied, the matter could be remedied by raising more taxes. If the same governmental service cost twice as much in one place as in another, that fact was not known, and, if known, it would have mattered little because actual competition was non-existent.

(c) The prevailing form of government usually provided for the election of the chief fiscal and accounting officers by popular vote, and, as was to be expected, they were more frequently selected by reason of their popularity and vote-getting ability rather than for their talent in and knowledge of municipal finance and accounting. More often than otherwise, those officials entertained something akin to contempt for new, advanced or improved accounting ideas. Where such feelings were absent, they displayed a complacent attitude toward established methods, due, no doubt, to the thoughts that tenure of office was insecure; that the holding of public office was a reward for political service; that to attempt to revise the accounts would entail a tremendous amount of hard work; that no money compensation or reward in the form of thanks or praise would be forthcoming; and, in short, that the easiest course was to let matters drift as they had in the past, take the compensation and honor incident of the position and at the end of the term deliver the office to the successor in much the same condition as it was received.

(d) And, finally, the taxpayers — the stockholders in the corporation — demanded no better methods, no more accurate, detailed and scientific statement of financial facts showing sources of revenue, objects of expenditure and the financial condition of their common business. The business man of capacity and affairs had been too busy with his personal matters to devote time and thought to the concerns and activities of government. That was left to the officers selected by the political organizations and their recognized heads.

Viewed in the perspective, it seems that in this era accounts were kept with one principal or primary object in mind — that of showing whether or not the fiscal officer had stolen money. In form, they indicated the liability of that officer to the municipality and appear to have been predicated on the assumption that the municipality would keep its own accounts. They utterly failed to display essential financial facts relative to revenues and expenses, what was owned, due or owed, or to tell any of the material stories concerning fiscal transactions which accounts should relate.

During the second period, very material changes are observed. The country grew in population and wealth. The population commenced to drift from rural to urban. Tax rates mounted higher and higher. The activities of municipalities were increased in variety and magnitude and, correspondingly, the financial transactions assumed proportions and importance which necessarily called for careful and accurate accounting. It was realized that to the old use of accounts as a means of testing the honesty of fiscal officers must be added their employment as a means of testing and measuring the efficiency of the work of all officers. There developed a general demand for municipal reform. Business men were chosen to fill important posts in municipal governments and, as was to be expected, they sought more comprehensive financial statements which would disclose more clearly the financial condition of their respective municipalities. Furthermore, civic organizations, of which the National Municipal League was one of the pioneers, sprang into existence, and they in conjunction with accountants employed in municipal work consistently and persistently advocated better accounting methods.

However, little was actually accomplished by way of changes within the period, but much was achieved in awakening and quickening thought. While the need was real, the response was not immediate, for, as has been seen, the municipal corporation, unlike a private business concern, could not enter the bankruptcy courts even though it possessed all the elements of insolvency. As in the previous period, municipal accounts were little more than cash-book entries and treasury statements. But the foundation upon which to build more substantial and appropriate systems was laid and the way paved for the rapid development in the period which followed.

It remained for the years intervening since the commencement of the 20th century to witness actual changes in accounting procedure. The demand for better accounting and the necessity of providing a system which would furnish exact knowledge of details and summaries of results in aid of better administrative direction and control induced some of the larger cities (Chicago, New York, Boston, Philadelphia and others), and a number of the smaller and other municipal corporations, to employ professional accountants to install improved accounting systems and to audit their accounts periodically. The accountants aimed, and to a measurable extent succeeded, to make the accounts disclose (a) the current cost of government, (b) the revenue provisions to meet that cost, (c) the property (other than cash) owned and (d) a complete statement of debt obligations. The plans worked out in each municipality were studied by officers and accountants having to do with the affairs of others. The movement was contagious. At the beginning of the year 1919 there was scarcely a city having a population of more than 30,000, in which some improvement in accounting procedure had not been made.

In a very considerable number of municipalities, centralized financial control and accounting are facts. Unit cost records, monthly departmental reports, uniform classification of receipts and expenditures, established fund accounts and subsidiary records and ledgers are actually being maintained or produced.

However, great as the improvement has been, there are relatively few municipalities in this country which are able to compile a complete financial statement, including a balance sheet, revenue and expense statement, records of city property and equipment, accurate and scientific sinking-fund records and other data, comparable to those obtained by up-to-date private business. (Consult *National Municipal Review*, Vol. VI, p. 715).

Some indication of the backwardness of cities is gleaned from the 1913 report of the auditor of the city of Cleveland. He said: "I have the honor to present for the first time in the city's history, a general and detailed balance sheet from our general ledger." Cleveland was at that time, in population, the sixth city of the United States. What was true of Cleveland prior to 1913 is equally true of many sizable American municipalities at this writing.

Uniform Accounting.— Coincident with the actual betterments made in the methods of keeping municipal accounts, there developed the movement for securing reasonable uniformity. The origin or development of the movement may be attributed to no one person, group of persons or association but interest in the whole subject was intensified as well as extended through the discussions and recommendations of numerous associations, national, State and local, of which the following are some of the more important: National Municipal League, League of American Municipalities, American Society of Municipal Improvement, United States Census Bureau, Bureau of Municipal Research, various State bureaus organized expressly for the purpose and an army of city clubs, business organizations, citizens' and taxpayers' associations, civic organizations and public-spirited individuals.

In this relation it is worthy of mention that the uniform accounting idea was not of American origin. In 1871, by act of the English Parliament, a "local government board" was created for the express purpose of establishing in counties, municipal corporations and towns, uniform systems of accounts, of complete audits of accounts and of uniform reports to the government of the financial operations and condition of local governmental units. The larger German cities, although not compelled by any statute, had for years maintained substantial uniformity of accounting methods which afforded excellent facilities for comparing costs of administration, maintenance, etc.

State Supervision.— The first step in this country toward State supervision of municipal accounts and accounting appears to have been taken by Minnesota in 1878, when an act was passed creating the office of public examiner, with power to audit the accounts of State and county officers and to enforce a correct and uniform system of bookkeeping in counties.

Minnesota's action was followed by Massachusetts in 1879, when it placed the accounts of certain county officers under the supervision of the savings bank commissioner. Later, in 1887, there was established the office of comptroller of county accounts. Without following the various amendments to the Massachusetts statute, it may be said that it does not confer power on State authorities to force or compel the establishment of uniform accounting methods. It does require the State to install such systems when invited or requested by municipal authorities to do so. Substantial progress and valuable and constructive work has been done in that State without finding it necessary to enact mandatory legislation. The power of suggestion and moral suasion has met with remarkable success.

The Wyoming constitution of 1892 made the office of State examiner of county accounts constitutional. That official has the general supervision over such accounts and a well-organized bureau has been in existence since Wyoming first became a State.

Other States which have enacted similar legislation are North Dakota, South Dakota, Ohio, New York, Iowa, Washington, West Virginia, Wisconsin, Rhode Island, Idaho, North Carolina, Nebraska, New Hampshire and New Jersey. In but few of the States has State supervision been completely inaugurated and established. In some of them the authority is to examine accounts; in others, to establish uniform accounting practices and, in some few, the measure of supervision is limited to certain classes of accounts, as is the case in New Jersey where the commissioner of accounts exercises jurisdiction in respect to sinking fund accounts only. Perhaps the most comprehensive statutes are those enacted in Ohio and New York.

The Ohio law was passed in 1902. It confers upon the auditor of the State jurisdiction to establish a uniform system of accounting, auditing and reporting for all counties, cities and towns in the State.

The New York act confers upon the comptroller of the State, except in respect of first-class cities and counties wholly contained within such a city, authority (a) to cause the accounts of each county, city, town and village to be inspected and examined periodically, as he may deem necessary; (b) to formulate, prescribe and install uniform systems of accounting in several groups of municipalities; (c) to require of fiscal officers of municipal corporations annual reports upon blanks prepared and furnished by him, and (d) to tabulate the substance of such reports in comparative statistical form so arranged as to reflect the financial condition of each corporation, its sources of revenue and the purposes and objects for which its funds have been expended.

Although these States have assumed supervision over municipal accounting, it does not follow that each municipality is keeping its accounts according to a uniform plan. Perhaps the situation in New York is typical of that existing in other States. No municipality of any considerable size in New York remains uninfluenced by the work undertaken by the State comptroller. Nevertheless, of 1,500 municipalities in the State, uniform systems are being successfully operated in no more than 300 of them. The work moves slowly because of the limited number of men employed and for the further reason that in smaller municipalities the officers are reluctant to have their accounting methods revised.

Who Should Keep Accounts.— Generally speaking, every office and department of a municipal corporation which collects or receives money or which is authorized to expend or authorize the expenditure of public funds should keep accounts thereof. In every municipality there is a chief fiscal officer. He may be called comptroller, auditor, accountant, treasurer, chamberlain, commissioner of finance, commissioner of accounts or any one of a number of names. Just what official is the chief fiscal officer depends entirely upon the provisions of the governing law and in that respect it is to be deplored that such laws do not always outline with clarity who the principal fiscal functionary is. But that official, by whatever designation known, keeps or should keep complete records of all fiscal transactions of the corporation. It is frequently found that the elements of authority or duty necessary to vest in a single office power adequate to constitute the incumbent thereof the chief fiscal officer of the governmental unit are distributed between two or more offices.

Municipal governing laws are by no means perfect, particularly the older ones. They are especially deficient along accounting lines and in relation to the formulation of financial plans (budgets). It is not so many years since laws were prepared by members of the legal profession, who, as a rule, had little knowledge of and less patience with accounting requirements and orderly financial planning.

It is at this point that the fiscal officer encounters the first serious obstacle if he is desirous of modernizing his accounting methods. In private enterprise it is comparatively simple to obtain authority to make changes in methods or even to reorganize the accounts completely. The situation is different in a municipality. It has no sovereign power What authority it possesses is derived from enactments of the State legislature. Frequently it is found that the law requires certain specific procedure which is not the best course or method to follow, or that well-nigh insurmountable legal provisions prevent doing in a direct, orderly, business-like manner that which accounting principles require. In fact, in very many cases the obstacles encountered have the effect of discouraging officials, impairing their enthusiasm and retarding the development of better accounting systems.

The first step in reorganizing the accounts of a municipality is to study its laws and ordinances, and sometimes that discloses the impracticability of undertaking the task until changes are made in the applicable laws and ordinances. It is evident that from time to time municipal laws must be changed by amendment and repeal until sound accounting principles shall be matters of law as well as of necessary business procedure.

Rudiments of an Adequate System.—Accountants are quite generally in accord respecting the goal or aim to be attained in municipal accounting, but they are not in agreement as to all details or methods of reaching results. In a measure, that is because of the different conditions existing in the various classes of municipalities or in municipalities of the same class operating under different laws. Nevertheless, it is possible to state with assurance that an appropriate system of municipal accounts must embrace certain elements. While it is not possible in limited space to make the outline inclusive of all features the following is believed to include the important characteristics.

Bookkeeping.— That the accounts, summaries, schedules and reports supply the information necessary to intelligent judgment and appraisal of results the accounts should be kept according to the double entry plan of bookkeeping. The single entry system is the more primitive but it exhibits in the form of a final statement one relation only — that of asset and liability. The double entry system discloses not only that relation but presents a classified summary of operations. The final summaries under a single entry system exhibit proprietary conditions. Under the double entry plan it is convenient and practicable to show whether or no the municipality has rendered the best service of which it is capable at the least cost, and whether its proprietary interests have been protected against the misuse and infidelity of its officers.

Terminology.— It is of vital importance that correct terminology be employed. It should be uniform in all departments of a municipality, and, if uniform terms be used by all municipal corporations, that greatly adds to the usefulness of final summaries, statements and reports. The terms to be employed should be selected with care. The Federal Census Bureau early realized the importance of establishing proper accounting terminology and for years has incorporated in its report of the statistics of cities what is believed to be the best accounting terminology obtainable.

Centralization and Co-ordination.— To have a complete system of accounts requires that every transaction be recorded. That should be done in the bureau where the transaction arises and, if possible, by the person in charge thereof. To utilize this record and to adapt it to the purposes of control, the various transactions must be classified and summarized and finally brought into statements of account in a central office. That should be the office of the chief fiscal officer of the corporation. When that plan is followed, reports and statements from the general ledger will reflect the operations and the condition of the municipality as a whole in such manner as to serve the purposes of officials and the public.

Not infrequently is it found difficult, if not impossible, to procure central accounting and to obtain co-ordination between the accounts of the chief fiscal officer and those of municipal departments. Usually that is caused by one or both of two conditions: (a) The governing lay may not require centralized control; and

(b) departmental officers may not be in sympathy or harmony with the plan and execute it with indifference. In such cases a campaign of education may be necessary in order to procure a change of condition.

Annual Budget.— The arrangement of current accounts by the fiscal officer necessarily follows the budget classification. A properly constructed annual budget usually reflects more of the business side of a municipal government than any other single document. It should be the financial program. Appropriations for expenditures are in the nature of allowances or drawing accounts. Expenditure appropriations should be correlated with the revenues intended to meet expenditures. From an accounting point of view, the annual budget affords the most satisfactory method yet found for gaining centralized control over municipal expenditures. Generally speaking, a proper system of municipal accounting can be obtained only when a well-arranged and properly constructed budget has been adopted.

The reorganization of a city's accounts should be undertaken at the time of the preparation of the annual budget.

Revenue and Expenditure Accruals.— True stories concerning the operations of a municipality cannot be told nor the effect of its fiscal activities accurately reflected unless the accounts show accruals of revenues and of expenditures as well as encumbrances of appropriations. The money actually received during a given period does not accurately measure revenue and the cash disbursed does not correctly state the cost of conducting the business of the corporation. The system should afford means of showing the financial condition of the municipality at all times. To accomplish this, there must be records which disclose not merely undisbursed balances of appropriations but, as well, the obligations incurred upon contracts and open market orders. In short, it should show what is owing the municipality as well as what the municipality owes.

Grouping of Accounts.— To secure correct information relating to the financial condition of a municipality, it is essential that the accounts, reports and balance sheets provide for a proper presentation of the facts by grouping the accounts; this for the reason that it is necessary to guard against the use of particular funds for purposes other than those intended. Otherwise, there is danger of having applied capital, trust or sinking funds to the payment of expenses incurred for current administration, operation or maintenance.

The grouping of accounts is not an arbitrary classification of them. All obligations entered into by a municipal corporation and all transactions recorded in its accounts pertain to some particular fund. Therefore, to assemble accounts in independent balancing groups is in formal recognition of the fact that every account naturally falls within one of several groups.

Into just what groups the accounts of a given municipality should be divided depends entirely upon the character of its business and the nature of the funds held. The comptroller of the State of New York, in a uniform system formulated for cities of the third class (those having a population of 50,000 or less), allocates the accounts to the following groups: (1) current accounts; (2) assessment accounts; (3) capital and sinking fund accounts; (4) trust accounts.

The current group includes those in which are recorded transactions relating to budget expenditure appropriations and revenues applicable to meet them, together with the financing done respecting those transactions. It is intended primarily to keep the record of current operations separate and apart from all other transactions. The distinction between current operations and all others is regarded as important and one which should be maintained in order that the results of current activities may be reflected simply and intelligently.

The accounts forming this group are closed at the end of the year into a current surplus or deficit account, thereby indicating how the financial plan actually worked out. If there is an excess of revenue over expenditure, it will be shown by a credit balance in the current surplus account. If the expenditures on an accrual basis exceed revenue accruals, then a debit balance will result, reflecting what is in fact a current deficit.

The assessment group includes all accounts relating to assessment work, the levy and collection of assessments, the financing of cost and assessments remaining uncollected.

The capital group embraces the accounts pertaining to bond issues for construction purposes (excluding assessable work) and the expenditure of the proceeds of such issues. There is also included accounts showing the value, appraised or assessed, of the municipality's property.

While the accounts for sinking fund transactions are included in this group, that is because in cities of the third class sinking fund transactions are not numerous. If in any municipality those transactions are of volume, a separate group of accounts should be established.

The trust group contains the accounts of all funds or properties held in trust, including pension funds.

Classification of Accounts.— Having assembled the accounts of a municipality into logical groups, it then becomes necessary to further classify them to show the channels or sources from which money is received and the purposes and objects for which it is expended. In this, as in other matters, uniformity should prevail and uniform terminology be employed.

With reference to receipts, a classification is not difficult. The groups other than the current accounts group will be arranged according to the nature of the transactions occurring. In the current accounts division, receipts will be divided into two general classes: (a) revenue and (b) non-revenue.

The revenue receipts may then logically be classified as (1) General property taxes; (2) special property taxes; (3) interest and penalties on taxes; (4) licenses and permits; (5) fines and forfeits; (6) interest and rents; (7) gifts and donations; (8) sales of property; (9) departmental earnings, etc.

In the non-revenue class will be found current loans, transfers, refunds, advances and such other classes as may occur in the municipality.

Respecting expenditures in the current accounts group, the situation is more difficult. It is very aptly stated in the January 1917 issue of the *Municipal Research Bureau,* that expenditures should be classified in as many different ways as there are stories to be told concerning costs. The following four methods are then indicated:

«1. Total cost incurred by organization units — to mark the lines of official responsibility and the jurisdiction of each spending officer.

«2. Total cost incurred, classified by *functions* — for determining questions of policy having to do with service rendered as well as to be rendered, and laying a foundation for appraisal of results.

«3. Cost of things classified by *objects* expended or used in carrying on the work; such as ‹personal service,› ‹supplies,› ‹materials,› ‹equipment,› etc.— to lay the foundation for considering the amounts to be appropriated to buy things needed.

«4. Total cost classified by *character,* that is with a view to determining what part is for current expenses, what part for capital outlays, etc.— to lay the foundation for considering financial policy.»

It is not probable that any municipal corporation is grouping its expenditures in the four ways indicated. In many of them, a twofold classification is followed — that is, by governmental function and by purpose or object of expenditure.

In the New York State comptroller's system for third-class cities, arrangement by governmental function is as follows: (1) General government; (2) protection of person and property; (3) conservation of health; (4) sanitation and promotion of cleanliness; (5) highways; (6) charities and corrections; (7) education; (8) recreation; (9) public utilities — non-commercial; (10) miscellaneous; (11) municipal indebtedness; (12) construction and permanent improvements (financed from tax moneys or current revenues); (13) public utilities — commercial.

His classification by purpose or object of expenditure is as follows: (a) Salaries and wages; (b) traveling expenses; (c) office expenses; (d) printing and advertising; (e) purchase of equipment; (f) maintenance of equipment; (g) materials and supplies — (g-1) specify; (g-2) specify; (g-3) specify; (h) repairs by contract or open market order; (i) light, heat and power; (j) rent; (k) insurance; (l) pension fund contribution; (m) other expenses — (m-1) specify; (m-2) specify.

The foregoing are based upon the classification worked out by the National Municipal League (Proceedings of 1899, pp. 116-123), as modified and adopted by the Census Bureau in many municipalities.

Stores' Accounts.— In order to ascertain the precise cost of administration for a given period, it is necessary to take into account, as an offset to charges against appropriations, the cost of materials and supplies not used. The best method is that of keeping a running inventory account of materials and supplies. To do that necessitates keeping stores accounts, in which case requisitions are issued when stock is called for by a department, and then expense may be charged and the appropriate stores account credited with the supplies so furnished.

If accounting requirements only were to be considered, it would be advisable for each municipality to adopt this plan. However, the size and the experience of the personnel of accounting offices in average municipalities has thus far rendered it impracticable to adopt such a system.

Substantially the same result may be attained by taking an inventory of materials and supplies on hand at the end of a fiscal year and by placing their cost on the records. Of course, the fiscal officer should audit the inventories and open an account for materials and supplies by debiting «materials and supplies» and crediting «inventory surplus.» The materials and supplies account will be temporary, to be opened at the end of the year and closed at the beginning of the next following year or as soon thereafter as the budget shall have been adopted, by reversing the entry or by charging against appropriations provided for the purchase of the particular class of materials and supplies shown by the inventories to be on hand. In the latter case, the charges against appropriations, less the inventory value of materials and supplies not consumed, will accurately reflect the total of actual expenses for the year. This plan corresponds with the practice prevailing in business concerns that do not keep running inventory accounts.

Unit Costs.— A noted railroad man, now deceased, will long be remembered for his advocacy of the principle of «ton mile cost.» The application of that idea may well be extended to many municipal functions. It would be of great interest and value if officials and taxpayers might know the cost per unit of street paving, sewer construction, street lighting, water pumping and filtration, etc., and the per-capita cost of public education and of maintaining patients in public institutions per day, week or month. Unit costs are the most significant bases for comparison and of great administrative value.

Commercial Public Utilities.— Municipalities are more and more engaged in commercial enterprises. Municipal water and lighting systems are common. Others are being added yearly. It is thought that a municipal water plant should maintain its departmental accounts in substantial conformity with the system adopted by the American Water Works Association, and that other public utilities, when operated by a municipality, should conform their accounting methods with the requirements of public service commissions in those States having such commissions, or with systems employed in private business of like character, if State supervision has not been established.

Municipal accounting has a pronounced effect on municipal government. Improved administration is sure to result from better accounting. Efficient administration is impossible without an adequate accounting plan. A suitable, adequate system of accounts in a municipality will enable the authorities to judge results of past operations, and plan and administer future activities with the assurance that they are acting intelligently. It will permit the taxpayers to appraise the accomplishments of an administration and to form accurate conclusions respecting the ability, the efficiency and the economy of their chosen officials.

Bibliography.— Eggleston, D. C., ‘Municipal Accounting’ (New York 1914); City Business, Metz Fund Handbook (New York 1913); American Water Works Association (Proceedings 1912); Deming, H. E., ‘Uniform Municipal Accounting and Home Rule’ (Proceedings, National Municipal League, 1905); Fairlee, J. A., ‘Essays in Municipal Accounting and Home Rule’ (Proceedings, National Municipal League, 1905); Munro, W. B., ‘A Bibliography of Municipal Government in the United States’ (Cambridge 1915); Public Service Commission, New York State, ‘Uniform Systems of Accounts for Gas and Electric Corporations’ (New York 1908); Travis, Eugene M., New York State Comptroller, ‘Uniform System of Accounting for Cities of the Third Class’ (Albany 1917).

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MUNICIPAL APPROPRIATIONS. See APPROPRIATIONS, AMERICAN SYSTEM OF; BUDGETS, AMERICAN.

MUNICIPAL ART SOCIETIES, organizations in the various large cities of the United States, devoted to the promotion of municipal art, and the making of the city beautiful. The ends of these associations are pursued by planting trees, restricting billboard advertising, establishing small parks and playgrounds in the congested districts, improving as far as possible the architecture of public buildings and in general making the city as artistic a unit as possible without hampering the commercial or utilitarian activities of the city. Among these organizations are the Municipal Art Societies of New York, Chicago, Cincinnati and Baltimore; the American Park and Out-Door Association; the Fairmount Park Association, etc. In several of the larger cities, as New York and Chicago, there are now official municipal art commissioners having supervision over public buildings, monuments, etc. (See ART, AMERICAN; CITY PLANNING; PARKS, PUBLIC). Consult Mawson, T. H., ‘Civic Art’ (London 1911); Robinson, C. M., ‘Modern Civic Art’ (New York 1903); id., ‘The Improvement of Towns and Cities’ (8th ed., ib. 1913); *Municipal Affairs* (Vol. II and III, ib. 1898–99).

MUNICIPAL BUDGETS. See BUDGETS, AMERICAN; APPROPRIATIONS, AMERICAN SYSTEM OF.

MUNICIPAL BUSINESS MANAGER. See CITY MANAGER; PLAN OF GOVERNMENT.

MUNICIPAL CHARTERS. See MUNICIPALITIES.

MUNICIPAL COLLEGES AND UNIVERSITIES. The United States.— The passion for free public education in the United States has carried well beyond the original intention. At first only the elementary school was free; tuition was free, and the schools were maintained by public taxation. Secondary education was then conducted by private academies and higher education by privately endowed colleges and universities. But before the free elementary school had become universal, free high schools were opened and maintained in the more progressive communities and by the close of the 19th century the free public high school was practically the uniform policy of public education in every State of the Union. Opposition to such free secondary education in tax-supported schools has almost entirely disappeared. The newer States have gone beyond this and have established universities, supported entirely by taxation and offering free tuition to residents of the State. This has strengthened the theory that all education in a free State should be at public expense, college, university and professional education.

The municipal college and university has grown out of the city high school in response to the public demand for higher education. High school work in modern languages, in mathematics and some of the sciences, overlap the college program in the freshman year. It is an easy step, therefore, to add college work to the high school program. Baltimore, Philadelphia, Charleston, Los Angeles, Cincinnati, Toledo, New York City, are cities where municipal colleges are now in operation. Cincinnati has developed a municipal university with the usual departments of medicine, law, dentistry, education and engineering, in addition to the College of Arts and Sciences. Toledo is developing a university along similar lines. New York City, on the other hand, has confined its efforts to the development of the college as distinct from the university idea. This is the municipal college in its perfect form since it is entirely supported by public taxation and admits as students only residents of the city of New York. Its equipment, costing upwards of $5,000,000, was likewise provided out of municipal funds. Other municipal colleges and universities have received private endowments in addition to municipal appropriations. The University of Cincinnati received a large private gift and is less typical of public higher education for that reason. The public high schools, sometimes called the «Peoples' Universities,» are fitted to develop into municipal colleges at the demand of the people. In the United States, colleges and universities frequently reflect local characteristics; for example, the University of Pittsburgh, the University of Chicago, the University of Denver, University of Buffalo, University of Rochester; but they must be carefully distinguished from municipal universities since they are not maintained by the cities where they happen to be located, nor is the student body wholly or even largely drawn from such city.

England.— England has developed a type of municipal college but they are not tax supported and therefore are not municipal institutions in the truest sense. Nevertheless, although on private foundations and maintenance, many of these English colleges are of local character, reflecting the local industries, local ideals, local pride. Thus the Sheffield College reflects the cutlery interests by its excellent «School of Metallurgy.» The College of Leeds reflects the textile industries by its «School of Textiles.» Birmingham, Liverpool and Manchester have local universities. The University of London has a long and honorable record.

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MUNICIPAL CONTRACTS. See MUNICIPALITIES.

MUNICIPAL DEBTS. One of the most striking facts in modern American city development is the appalling increase in municipal indebtedness. Startling figures upon this subject have been compiled by the United States Census Bureau. Municipal and country debts increased 76 per cent from 1890 to 1902. From 1902 to 1913 they had increased 113.2 per cent and had reached the enormous net total of $3,475,954,353, or more than twice the combined indebtedness of the Federal and State governments. At the end of the fiscal year 1915 there were 146 of the cities in the United States which had a population of more than 30,000, whose total indebtedness exceeded that of the national government by $1,155,758,406 or 106 per cent. In these cities the per capita debt had increased from $44.71 in 1903 to $77.86 in 1915. That this increase in indebtedness has not been uniformly rapid, however, is shown by the fact that in Rhode Island the debts of cities, towns and villages increased less than 1 per cent between 1902 and 1913, while in California there was an increase of 986.1 per cent during the same period.

An accurate statement of the causes of this increase in municipal indebtedness does not reflect credit upon the soundness of our municipal finance. After the Civil War American cities very generally embarked upon programs of reckless expenditures for various municipal services and utilities. These were paid for by the issuance of bonds. These bonds were too frequently issued for terms much longer than the life of the improvements or property for which they are to pay. Cities also entered upon the unwise policy of borrowing to meet the current expenses of the city. Inefficient methods of municipal accounting contributed to the general financial chaos. State supervision was too often inadequate to the task of preventing the floating of ill-advised municipal loans. To all these factors should be added the general recklessness and optimism of municipal administrators who were never depressed by the consciousness that money once borrowed must ultimately be repaid.

The conviction that municipalities cannot be trusted to borrow money without restraint while not new has in recent years grown stronger. This is clearly evidenced by the increasing number of restrictions placed upon the borrowing power of the American city which may be thus summarized:

Restrictions upon Municipal Indebtedness.—(1) A city must not incur debts beyond its delegated powers. The power to borrow must either be given in express words in the city charter or it must be implied from some power which is specifically granted. Without such positive authority debts incurred by the city are absolutely void.

(2) Municipal debts may be contracted only for public purposes and not for the benefit of private individuals or groups. This restriction is the logical result of the well-established rule of constitutional law that taxes may be levied only for purposes which are public, inasmuch as the city's debts must ultimately be paid by taxation.

(3) Limits upon the amount of municipal indebtedness which may be incurred are found in the statutes or constitutions of most States. These restrictions specify that city debts must not exceed a certain per cent of the value of all the taxable property, all the real property or must not exceed the annual income of the city. These percentages vary greatly, running up to 18 per cent in the constitution of Virginia. The establishment of a debt limit in a State constitution does not confer upon cities any power to create an indebtedness up to that limit and the State legislature may, by statute, impose additional restrictions in its discretion. Any debts contracted by the city beyond the limits so set are void and persons who loan money to municipalities must learn at their peril whether the city, in issuing the bonds they buy, has exceeded its debt limit. Both constitutions and statutes sometimes provide that in determining whether the total indebtedness of a city exceeds the limits set, debts incurred for certain special purposes shall not be included. The debts so excluded are those contracted for the purchase or construction of public utilities such as waterworks or lighting plants from which the city expects to derive revenue. There is a difference of opinion as to the wisdom of this policy. It has been urged that bonds issued for these revenue-bearing projects should be counted in computing the city's debt unless such bonds are secured merely by liens or mortgages on the properties in which the money was invested and do not constitute general liabilities upon the credit of the city. In short if the bonds will be paid ultimately out of money derived from taxation they should be viewed in the same light as debts incurred for any other purpose.

(4) Statutory or constitutional provisions frequently require that bonded debts shall be contracted only after a vote of the people registered in a special election upon the question. Such a referendum may be required for the creation of any debt, or of such debts as would be in excess of a specified amount, or of debts which are to run for more than a certain length of time. In some cases two-thirds or more of the voters must approve the proposed debt; in other instances only taxpayers or property-owners are allowed to vote.

(5) Maximum period of years to constitute the life of the debt is often stipulated. These limits are frequently placed at from 20 to 30 years but in some cases the term will vary with the purpose for which the debt is incurred. By vote of the people, above mentioned, the length of the debt term may be extended in a few instances.

(6) One of the most common restrictions upon municipal indebtedness is that which compels the city when incurring a debt to levy a direct tax annually during the life of the debt for the purpose of paying the interest and of accumulating a fund out of which to pay the principal at maturity. Such a fund is known as a sinking fund. This fund must not lie idle but must be profitably invested by the city.

These restrictions upon the power of American cities to borrow money have been of some use in preventing financial recklessness on the part of cities, but in general the policy of setting up hard and fast restrictions of general application to all cities is unsatisfactory. There is an unfortunate lack of elasticity. Some cities cannot borrow as much as they need; others borrow more than they need. A debt limit based on assessed property values is an incentive to raise the assessments unduly. There are no general legislative or constitutional restrictions upon the power of English, French or German cities to borrow. Instead municipal debts in those countries are supervised as to purpose, amount, interest-rate and methods of repayment by administrative authorities of the central government. This administrative control is exercised in England by the local government board, in France by the prefect, in Prussia by the provincial authorities. By this method the city's debts are adequately regulated but by a means elastic enough to meet the needs of the individual city.

Kinds of Municipal Debts.— Municipal debts may be classified in several ways. A debt may be *funded*, in which case it is represented by interest-bearing bonds issued for a definite period, and with some definite provision for repayment at maturity, or it may be a *floating* debt, not secured by bonds, usually small in amount, and with no special scheme provided for its repayment. The latter comprises usually the short-time obligations which the city incurs in special emergencies in connection with the current needs of administration. The floating debt is usually funded when it becomes large in amount. The bonds representing the funded debt of the city are usually negotiable and are sold in the financial market like the securities of private corporations. They usually bear recitals stating the authority under which they were issued and other facts tending to show their legality. If these recitals are false for the purpose of floating an illegal bond issue, the courts will refuse to allow the city to escape paying its just debts by setting up the falsity of its own statements. This is known as the doctrine of estoppel by recitals. The *gross* debt of the city is the sum total of all its funded and floating debts. The *net* debt is the amount of the gross less the amount of such sinking funds as have accumulated for the ultimate repayment of the funded debt.

Methods of Borrowing.—A city may follow one of two policies in borrowing money. *First,* it may issue *sinking-fund bonds,* all of which mature at the same time, and which are to be paid out of a fund gradually created for the purpose. This plan has thus far been most often used. It has, however, several disadvantages. It requires the setting aside of a certain part of the city's income each year and the investment of that money. Sometimes through miscalculations, carelessness or dishonesty the funds are not properly invested. Sometimes the annual stipend is not paid into the sinking fund as it should be. The second method of borrowing is by issuing *serial bonds.* These bonds mature at different times in such a way that a fixed proportion of the debt will fall due each year and must be retired. The advantage of this plan is that there is no necessity for a sinking fund with the problems it creates and there is no way for the city to escape its annual payment short of absolute default of the bonds which annually mature. The weight of opinion now favors this plan.

Bibliography.— Cooley, 'Handbook of the Law of Municipal Corporations' (Chap. 19, 1914); Dillon, 'Municipal Corporations' (Chap. 20, 5th ed., 1911); George, R. E., 'Municipal Finance' (1916); Munro, 'Bibliography of Municipal Government' (pp. 413–416, 1915); Munro, 'The Principles and Methods of Municipal Administration' (1917); United States Bureau of Census, 'County and Municipal Indebtedness, 1913, 1902 and 1890' (1915); United States Bureau of Census, 'Financial Statistics of Cities' (1915).

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MUNICIPAL GOVERNMENT. In March 1897, as a tribute to the growing public interest in the city problems, 'Bibliography of Municipal Administration and City Conditions' was published as the first number of the quarterly magazine, *Municipal Affairs.* Even at that time the list of books and articles dealing with the various aspects of city government drew its lengthening trail through no less than 224 octavo pages. It is well nigh beyond the power of the imagination to see to what length a similar bibliography of municipal administration prepared in 1916 would run. The extraordinary interest in municipal government exhibited during the past 20 years in this country has been the result of certain fundamental facts. America has been rapidly changing from a rural to an urban nation, so that the proportion of the people who are members of municipal corporations has greatly increased. Furthermore, the rapid development of facilities for transportation and communication has made the cities of the country assume an importance in the public interest even surpassing their importance on the basis of population. Finally, the older cities, having grown to be great with little conscious guidance and with no adequate recognition of the obligations imposed upon a municipal corporation by the very nature of urban life, or of its inherent privileges, have during this period made a virtue of necessity in beginning to take thought for the civic problems of the present and the future.

1. Origin of Municipal Corporations.— It is not possible to draw an exact line between rural and urban conditions, and it is a fact that municipal government in its more complex and commanding forms is the result of a gradual development from the simple military government of the army post or the simple rural government of the agricultural town. When a community has reached the stage where it is willing to organize a municipal government it is ready to take a long step away from the Anglo-Saxon individualism so well expressed by the old saying that «the «Englishman's house is his castle.» It is, of course, true that political government in any of its forms means a curtailment of individualism. But the phenomena of city government marks a distinct advanced stage in this process. Let the man who believes that he has an inalienable right to «do that which seemeth good in his own eyes» and to «do as he pleases with his own,» beware of the city! The utmost development of social control to be found in the latest city planning scheme is inherent in the first formal recognition of the fact that the conditions of urban life make necessary a special form of government. People cannot live close together without submitting their individual whims and fancies to community control. In this fact the city has its origin.

2. Relation of Municipal Corporations to State and National Government.— It is the theory of American law that sovereignty, as manifested through the colonial and subsequently through the State governments, precedes both in time and authority the powers which are manifested in the operation of municipalities. In other words, the city, although it is a normal development of the economic and social needs of the people, acquires no governmental powers except as they are granted by the sovereign state. Thus the direct control of the States over the municipal corporations within their borders is theoretically complete, even to the point that municipal governments might be abolished altogether and their functions discontinued or transferred to central authorities of the State. This theoretically helpless position of the cities has subjected them to many abuses, particularly at the hands of the State legislatures, with the result that one of the most potent reform movements connected with city government has been the movement for municipal home rule. The purpose of the home rule movement is not to create *imperia in imperiis* or to remove the cities from the jurisdiction of the States in their sovereign capacity. It is rather to give the cities in each Commonwealth a constitutional status and to this extent to curtail the general governmental powers conferred upon the legislature. Municipal home rule in various forms has already been embodied in the constitutions of the following States: Missouri, 1875; California, 1879; Washington, 1889; New York, 1894; Minnesota, 1896; Colorado, 1902; Oregon, 1906; Oklahoma, 1907; Michigan, 1908; Arizona, 1912; Ohio, 1912; Nebraska, 1912; Texas, 1912. The chief purposes of municipal home rule are to enable cities (1) to frame their own charters and thus choose their own forms of government; (2) to prevent legislative interference with municipal affairs by means of local and special legislation; (3) to exercise police control over their inhabitants in accordance with the dictates of local public sentiment; and (4) to determine what co-operative functions shall be undertaken by the community. It is noteworthy that of the large cities of the country, Saint Louis, Cleveland, San Francisco, Kansas City (Mo.), Seattle, Portland (Ore.), Denver, Saint Paul and Toledo, are living under charters framed and adopted by their own people, subject in some cases to subsequent ratification by the legislature. Detroit, Cincinnati and Minneapolis are only deterred from having home rule charters by their inability thus far to devise any that are satisfactory to themselves. Many of the States not enumerated above have provisions in their constitutions forbidding the legislature to pass local or special acts amending city charters or interfering in the internal affairs of cities.

In theory the national government has no control whatever over the forms or functions of municipal government. In practice, however, the Federal government exercises considerable indirect control over cities through its control of interstate commerce and the use of the post roads, as well as through its control over navigable waters and the development of natural resources such as water powers. Still more important in practical effect is the judicial control exercised by the Federal courts over the actions of municipal governments affecting contracts and property rights. The Federal government, of course, has complete control of the city of Washington, and at the beginning of President Wilson's administration it was suggested that an effort should be made to make Washington distinctively a model city to which all the other cities of the country could look for the latest and best developments in administrative machinery and municipal practices. In fact, the Federal government has for many years endeavored to co-operate with cities throughout the country, particularly in the development of a uniform system of accounts and the publication of uniform statistics and in the establishment of uniform standards for the testing and control of the gas supply. These activities, however, are purely advisory.

In the extra-legal aspects of the relations between municipal government and the State and national governments, the political issues which have their origin in municipal problems are becoming very important. In the early stages of the municipal reform movement in this country, it was thought necessary to separate municipal elections from State and national elections so that the voters would not be confused by political issues and by the exigencies of party strife in the selection of their local officials. Prof. Frank J. Goodnow, the eminent authority on administrative law, was a pioneer in trying to work out a proper delimitation of the spheres of local and State government in order to find a basis for an intelligent home rule program. This task, however, proved to be one of very great difficulty and in spite of the continued efforts of scholars in the universities, reformers in the National Municipal League and other organizations, and public officials in various associations for the promotion of home rule, no exact definition of the proper scope of municipal government thus far devised has yet met with general acceptance. In fact, while the sentiment for municipal home rule has been slowly finding expression in constitutional and statutory provisions, conditions have been growing up which make cities necessarily more and more dependent upon each other and upon the State and nation. A theory of home rule which might have been considered adequate 20 or 30 years ago would now be subject to important modification, in view of the fact that urban interests and urban problems have, as it were, overflowed the boundaries of the municipalities and have become, especially in the more densely populated Commonwealths of the East, closely identified with State interests and State problems. The old demand for the separation of State and local elections and politics has thus lost much of its force. With the election of United States senators by direct vote of the people the chief link that formerly tied the State government to national politics has been broken so that at the present time the more logical line of separation as to elections and political issues is between municipal and State on the one hand and national on the other, but even here a solidarity of interests is arising, notably in connection with the development of water power and the conservation of natural resources, which tends to make undesirable any hard and fast separation of political organizations and issues among local, State and national.

3. Relation of Cities to County and Township Government.— Counties are in the main divisions of the State established for convenience in the administration of State laws through the agency of locally elected officials. The functions of the county usually include the prosecution of criminals, the keeping of records relating to the title of property, the administration of the Inheritance Law, the care of the poor, the supervision of public education and the planning and execution of certain major improvements such as important highways, bridges and drainage schemes. The primary functions performed by counties are universal ones, and the absence of any strict administrative control by the State government over county affairs, together with the original prevalence of the fee system through which many of the county officers have received their compensation, has made county government all but universally the football of politics, and county officials everywhere the main cogs in the machine of one or the other of the two principal parties, according to whether the one or the other has been in control in particular counties. These conditions tend to establish a situation very embarrassing to municipal government in those counties where, through urban development, the vast majority of the electors are also electors of one city. Side by side with the increase in the complexity of the activities of the city, the expensiveness and political importance of county government grow. The result is a duplicate system of local government, with extravagant expenses and no end of political interference. Under these circumstances, movements have taken place in many of the States for the consolidation of city and county governments wherever large cities have sprung up. Wherever this consolidation has been established the county functions have been taken over by the city government and thus the city, in a sense, has been taken out of the regular administrative organization applying to other portions of the State. The most notable instances in which this consolidation of city and county government has been partially or completely established are New York City (which includes five counties whose affairs are partly under the jurisdiction of the central board of estimate and apportionment and partly still conducted by county administrative officials), Philadelphia, Saint Louis, Baltimore, San Francisco and Denver. In Virginia all the cities, large and small, are separate from and independent of the counties within which they are located.

So far as township government is concerned, cities often remain subject to it until they become large enough to absorb all of one or more townships, when the functions of the several town governments included within the city limits are usually taken over by the city and the separate township organizations abolished. The infinite confusion and difficulty that results from the persistence of a multitude of different local governmental bodies occupying in whole or in part the same territory is perhaps best illustrated by the experience of Chicago, where until comparatively recent years even the assessments of property forming the basis for municipal taxation were made by independent assessors elected by the different towns surviving within the city limits, with the result that all the assessors competed against each other to keep down the assessments of their particular towns. The result was that Chicago struggled along for many years trying to operate its municipal government under a constitutional limitation of its debt based upon a low percentage of its assessed valuation, although that valuation was in fact only 8 or 10 per cent of full value. The experience of cities points to the conclusion that in the interest of efficiency and economical government all local functions and all administrative functions performed by locally elected officials within the limits of the city should be consolidated with the city government.

4. Relation of Cities to Each Other.— Theoretically all cities, even those of the same State, are independent political units, having no formal relations with each other, and responsible either to their own people or to the people of the State as represented in the central government. However, with the enormous increase in urban population, particularly in the Eastern States, cities have in many cases begun to crowd each other. Sometimes two or more communities which started out as independent urban units have actually grown together as far as their industrial and social life is concerned without as yet being consolidated politically. In other cases, the extra-territorial needs of a great urban community for water supply, drainage, transportation and harbor facilities or electric power have brought cities into contact with the interests of other cities whose locations may be quite remote. For example, around the city of Boston has grown up a group of cities which, while politically independent of each other and of the metropolis, are all actually inter-dependent, so far as water supply, drainage and park development is concerned. The result in this case has been the establishment by State authority of metropolitan districts under the control of State commissions whose duties are to co-ordinate and promote the interests of all the constituent cities in the matters subject to their jurisdiction. This form of co-operation is in effect partial consolidation through State initiative. As another illustration we may take the city of Newark, N. J., which is closely surrounded by a group of overflow cities, all combined together so far as public utilities are concerned, by one semi-private agency, the Public Service Corporation of New Jersey, which operates the street railways, the gas plants and the electric light and power works in all of them. In this case the control over these utilities which the individual cities have necessarily in large measure lost is exercised not through a metropolitan district nor through a federation of the cities concerned, but through a State board of public utilities having jurisdiction throughout the limits of New Jersey. In Ohio a few years ago a group of cities centring around Akron and Canton, all served by the transit system of the Northern Ohio Traction and Light Company entered into what was called the «Inter-City Traction League» for the purpose of assembling their complaints against the traction company, co-ordinating their remedies and uniting to present their demands to the public service commission of Ohio. In California a few years ago an act was passed by the legislature enabling cities to federate and establish districts coterminous with the areas served by particularly utilities for the purpose of acquiring and operating such utilities. Cities throughout the country have found it to their interest to combine informally in organizations for the study of municipal problems and the interchange of experience. Notable among these are the League of American Municipalities and The Utilities Bureau. In many States also leagues of municipalities have been formed which often have their nucleus in the municipal reference departments of the State universities and thus give to their constituent members the benefit of the research and constructive suggestions of modern applied scholarship.

5. Influence of Increase of Population upon the Development of Municipal Problems.— While cities remain small and are surrounded by wide stretches of agricultural territory, it is only the simplest communal needs, such as water supply, drainage and police and fire protection, that go to make up the necessary functions of city government as distinguished from rural local government. As cities grow larger, however, and as more cities spring up primarily dependent upon the same outside areas for water and food supplies, the original city problems became more complex and their solution more difficult. Furthermore, cities as they grow not only spread over larger areas but become more congested at their centres. Wherever cities become so large or so crowded that the open spaces of the country are no longer readily accessible to children and that even play-spaces under the crowded conditions of urban life are at a premium, the nature of the problems of the city government undergoes a radical change. Size and congestion transform the environment of the home and thereby make necessary a whole series of municipal functions, centring in the problems of health, recreation and education. It is with relation to these problems that cities have been prone to neglect their duty and to postpone the expenditure of thought and money necessary if the inherent and fundamental disadvantage surrounding human life in large and congested cities is to be in any reasonable measure overcome. The trouble is increased by the fact that as cities grow bigger the value of land mounts high and only the few who are relatively rich can afford to own their own homes unless, indeed, their less well-to-do fellow citizens seek remote suburbs. In any case the vast majority of the down town population will be made up of renters. Also, as the city gets larger, the community life changes. It is no longer possible for every citizen to be acquainted with the majority of his fellow citizens. Instead, he maintains his acquaintance with the comparatively few who are associated with him in his work or in his social or religious activities, and such associations become less and less neighborhood affairs. The result is that the citizen gradually becomes more and more dependent upon the newspapers and upon the official party organizations for the knowledge and leadership by which his civic activities must be guided. Moreover, the increase in the size of a city and the enormous changes in the value of the land upon which it is built and in the size and profitableness of its industries tend to separate the population more and more into classes. The rich become very rich and for the most part live in the most beautiful and exclusive districts of the city, while the poor become very poor and live crowded together in the slums. There are abnormal contrasts between splendor and squalor and the public opinion of the community becomes more inert and less intelligent; it becomes less responsible to the ordinary demands of citizenship and reacts with greater passion and recklessness upon the extraordinary ones. Urban life creates enormous commercial, industrial and social values. Those who first flock to a city, eager for these economic and social advantages, overlook to a large extent the countervailing disadvantages inherent in social congestion and for a long time, through ignorance, carelessness or greed, refuse to pay the necessary costs of overcoming these disadvantages. As a result the problems of the city are cumulative, so that after it has reached a certain size and finds that it must try to remove these neglected disadvantages at whatever cost, it begins to feel the pinch of civic poverty and is never able fully to catch up with its work. The unpaid judgments of civilization that have been piling up against it can no longer be escaped, and this fact combines with many others to make municipal functions in large cities extremely complex and extremely expensive. The law diminishing returns as applied to agriculture may be considered to apply also to the activities of municipal government Beyond a certain point, which is determined primarily by the size of the city, the community gets a diminishing return for every dollar spent, but since the necessity is increasing the number of dollars to be spent increases by a geometrical progression.

6. The City Plan.— The first conscious constructive act of a community organizing itself into a city logically should be the development and adoption of a city plan, to utilize to the greatest advantage the site occupied by the city and to guide the city's growth for the future. It would be an error to say that this fundamental duty has been universally and completely neglected by the cities of America; for in a number of cases, of which Washington and Detroit are notable examples, city plans have been laid down at the beginning and more or less closely adhered to in their larger outlines. Moreover, the laying out of a single street, the construction of a harbor, the development of a sewerage system or of a municipal water supply, is in itself an act of city planning. Where most cities have lamentably failed is in the fact that they did not at the beginning exercise wise prevision and lay out a comprehensive plan of development when it was possible to do so. The purpose of the city plan is fundamental and complex. Every city has certain advantages of site which account for its existence. Through its location it establishes its relations with the outside world, upon which it is absolutely dependent not only for its growth and riches, but for its very life. As the sites of cities are of infinite variety and as the city plan must be made in every case with regard to the particular site, it is futile to attempt to work out a uniform city plan good for adoption by all cities. The plan must utilize the site by developing all its inherent physical advantages as a terminal for transportation and traffic, by removing so far as possible, even at great expense if need be, its inherent disadvantages and by opening convenient thoroughfares for all kinds of traffic. The importance of providing great radial highways reaching out into the surrounding country can scarcely be overestimated in the case of cities largely dependent upon direct communication with their agricultural environs. Where a city is situated upon navigable waters the development of the harbor and of the water front terminals in convenient relation to the distributing land arteries within the city or reaching out from it is one of the greatest factors in a good city plan. In this connection it may be noted that of the 28 largest cities in the United States, all but four or five have the advantage of navigable waterways and owe their greatness in considerable measure to them. Under modern conditions, since the railroads have become the great land highways of the civilized world, the provision of adequate rights of way and terminal facilities for them is perhaps the most important single factor in the city plan, at least so far as it relates to the industrial and commercial growth of the city. But the city plan has other functions besides establishing convenient means of communication with the outside world. It is also to provide for the internal convenience of city life. Upon it depends whether the streets shall be wide or narrow, straight or crooked; whether street railway lines shall be conveniently laid out for rapid and comfortable transit; whether swamps shall remain undrained and hills undeveloped; whether there shall be playgrounds for the children and parks for all; whether available lakes and beaches shall be developed to their maximum usefulness; whether there shall be civic centres adorned with beautiful and convenient structures, or whether public buildings shall be dropped hit and miss about the city without reference to dignity of approach or convenience of use; whether skyscrapers and hovels shall nestle aganst each other or through proper zoning and restriction of the heights of buildings, each section of the city shall be utilized to the maximum without the egregious inconsistencies so often characteristic of unregulated development; whether the homes of the people shall be constructed with reference merely to the rents that can be extorted from the unfortunate or with reference to comfort, sanitation and the provision of adequate sunshine and fresh air. City planning in its broadest meaning comprehends all the fundamental and permanent civic improvements which are ordinarily paid for out of bond issues or special assessments, as distinguished from the current operations of the city government, the expenses of which are paid out of taxes and other annual revenues. One of the most important and most difficult problems of the city plan is the adoption of adequate measures to control the development of suburban communities at the time outside of the city limits but which sooner or later will inevitably be brought in. This is an extra-territorial problem and the city cannot solve it in any reasonable measure unless it receives from the State drastic extra-territorial powers, and in the exercise of such powers through a permanent agency brings all suburban land subdivisions and other basic improvements under strict control and into harmony with a plan which the city itself has worked out for the development of the larger community of which it is the centre.

7. The Disposal of Wastes.— The primitive method for the disposal of sewage and liquid wastes is based upon the fact that water runs down hill. Most cities, up to comparatively recent times, have drained off their surface waters and their sewage as best they could into the nearest available stream or body of water that would carry it away or absorb it, but the obviously diastrous results that come to a city from pouring its sewage into its own water supply early led to the taking of some precautions against this particular civic blunder. For a long time, however, every city was careless of the welfare of communities further down the stream which often were dependent upon the same river for their drinking water. At one time it was the theory that sewage-laden water would purify itself by running a few miles, so that the down-stream communities need not be afraid, but the immense increase in urban population and the consequent increase in the volume of sewage has compelled cities willingly or unwillingly to spend enormous sums of money to carry their sewage for away or to establish purification plants for treating it before the innocuous effluent is permitted to run into rivers or other bodies of water. The disposal of wastes, however, includes much more than sewerage. It includes the collection and final disposition of garbage, ashes and household wastes, the removal of dead animals and the provision of cemeteries or crematories for the disposal of the human dead. These problems are far from simple and their complexity multiplies as cities become large. Ashes and cinders, if not mixed with garbage or other household wastes, may be profitably used for filling in and even as material for the construction of certain improvements, such as roadways and sidewalks. Garbage is one of the most persistent nuisances of the city. The efficient handling of the garbage problem requires the close co-operation of the individual householder with the civic authorities. The health of the community, especially during the warm months, requires that the garbage should be kept isolated from the time of its production to the time of its final disposition. This means tight cans, covered wagons and prompt cremation or reduction. But the very process of cremating it or of reducing it is so offensive that cities often find difficulty in securing proper and convenient locations for the garbage works. Cemeteries and crematories are very often established and maintained by private organizations, but in every case the city must see to it that the cemetery is not located so as to endanger the public water supply or otherwise affect the community's health.

8. The Public Water Supply.— It is the custom in the country and in very small villages for each householder to develop his own domestic water supply by means of a well. But in some locations individual wells are extremely expensive and in any case villages do not become very populous before the danger from the general use of well water is recognized on account of the possibilities of its contamination. No general sewerage system is possible until a public water supply under pressure has been developed and so the very inability of the young communities to dispose of their sewage increases the danger of their primitive water supply and hastens the time when a public supply must be developed. As cities grow larger and the volume of water required for domestic, industrial and public purposes becomes greater than any suitable supply available in the immediate vicinity, it becomes necessary to build aqueducts and pipe lines to distant watersheds and to spend enormous sums of money to protect the purity of the supply, to bring it to the city and to distribute it to the people for its various uses. If mountain water is available, it can generally be delivered by gravity and needs no special treatment for purification. If water has to be taken from rivers or lakes it requires expensive pumping machinery to lift it from its natural level and force it into the distributing mains under pressure. If the public water supply has to be taken from the ground it requires the construction of infiltration galleries or series of wells, often very deep and expensive, with elaborate collection works and often double sets of pumping machinery to make it available for use. If the only available water supply is in its natural state impure or otherwise unsuitable for domestic or industrial uses, it has to be treated by filtration or by the use of chemicals to render it safe and suitable for use. It is noteworthy that of all public utilities the water supply is the only one (if we except sewerage) which has come to be generally recognized in the United States as appropriate for municipal ownership and operation. Many cities, especially the small ones, are still served by private water companies; nevertheless, the public investment in water supply far outweighs the private investment. It is sometimes suggested that water, which, like air and sunshine, is provided by nature for the necessities of all living creatures, including man, should be as free as air and sunshine to the denizens of cities. While there is something to be said in favor of this proposal, nevertheless water differs from air and sunshine in that it has to be collected, stored and distributed and in some cases really manufactured by the purifying process in order that it may become available for use. It is, therefore, the general policy of those cities which furnish the water supply to sell it as a commodity to consumers, thus paying the expenses of the installation and operation of the waterworks. This practice involves the city in the difficult problem of rate-making and the establishment of rules and regulations for the curtailment of use and waste. Even if water were to be furnished free to the consumers it is obvious that they could not be permitted to use it extravagantly or to waste it without limitation. Such a policy might bankrupt in a little while the richest city in the world. As a means of distributing the costs of the water supply justly among the various consumers and as a means of curtailing waste, the metre system has been adopted in many cities. The administration of the metre system involves large expense for frequent inspection, reading and testing of metres and for repairs and renewals. The city is thus confronted with all the difficult problems involved in the construction and operation of a public utility and the maintenance of amicable commercial relations with all its citizens. The water supply is vital, not only for the health and convenience of domestic and business consumers, but also for public purposes, particularly for use in the extinguishment of fires, for the flushing of sewers and the sprinkling of streets. Without an adequate water supply, fire protection is impossible. The double purpose for which water is provided involves the city in the question of the proper distribution of costs between the individual consumers and the city at large. In many cities all the expenses of the waterworks are charged against private consumers and no allowance is made the water department on account of the water and other facilities furnished for fire protection, street-sprinkling and other public purposes. Where this system prevails the consumers of water, a prime necessity of life, are in effect indirectly taxed for the benefit of the city at large. The adjustment of this problem involves one of the most important and difficult problems of municipal accounting. Certainly a city cannot afford not to keep its books in such a way as to enable the public to tell what the water supply costs, what its actual revenues are and what is the fair value of the services, if any, which it renders without charge.

9. Protection Against Fire and Flood.— To persons living in separate houses in the country, the danger of loss by fire is always present, but it is a danger that arises in most instances from the carelessness of the householder or his family. But when great numbers of houses are crowded together in a city, every man's home is endangered by the carelessness or misfortune of every other man. Nothing can be more terrible than a great conflagration such as the fires that at different times have swept Chicago, Boston, Baltimore and San Francisco. It is probably true that not a large city in the United States would escape such a conflagration for a month, certainly not for a year, if it were unprotected by elaborate fire-fighting machinery and facilities and a trained force of fire-fighters. The fire department is the most picturesque of all municipal departments. It appeals most to the imagination of the entire community, because city dwellers are more or less conscious all the time that it stands between them and disasters which are ready to spring upon them in any unguarded moment. Fire protection is primarily designed for the protection of property values, the accumulations of invested wealth making up the homes, the offices, the factories and other equipment, which together constitute the tools of city life. In order that fire protection may be adequate, the organization of the fire-fighting men and machinery has to be correlated with the right kind of a water supply. Not only must the total supply of water for the city be sufficient to meet all emergencies, but the distributing mains must be of such a size and be so correlated and fire hydrants must be so placed that the volume of water potentially necessary for the extinguishment of a large fire shall be available upon the instant at any point where perishable buildings stand. In the smaller towns which cannot afford powerful fire engines, it is important that the water pressure in the mains should be sufficient to raise streams to the tops of the tallest buildings in the place. In places where powerful fire engines are provided, the most important thing is to have a sufficient supply of water available at every hydrant outlet. The engines will do the rest. In the very greatest cities it is sometimes deemed necessary to install a separate system of water mains designed exclusively for high-pressure fire service. However, the effectiveness of fire protection does not depend altogether upon the supply of water available for extinguishing fires after they get started. It is most necessary in cities that measures be taken to prevent fires. One of the first of these measures is the establishment of a central zone called the «fire limits,» within which property owners are not permitted to erect buildings which are easily combustible. This control of structures becomes very drastic in some of the great cities and extends far beyond the mere question of the materials to be used in construction. It includes provisions for the supervision of electrical wiring and for the approval of the plans for the interior construction of buildings. Fire prevention also requires the prohibition of the storage of combustibles except in approved places and according to approved methods. The fire department, in order to be efficient, must be ready to give almost instantaneous service. For this purpose it is necessary to establish a complete system of fire signals with fire-alarm boxes scattered through the city. For the protection of life in connection with possible fires the city has to see that fire escapes are placed upon all non-fireproof buildings above a certain height in which people live or are employed. It also has to establish rules in regard to the location and opening of exits in public buildings, in regard to the operation of motion-picture shows and in regard to many other things which, if left to themselves, are likely to increase the fire hazard.

While the dangers of fire are constant, many cities are so situated with reference to the natural flow of waters that they are in periodic danger of destruction or serious damage from floods. The maximum flood may not come oftener than once in 50 years, but if it comes and no provision has been made to safeguard the city against it, its ravages may be so great as to more than justify the expenditure of the enormous sums necessary to protect the city against its recurrence. The flood danger does not generally affect cities situated on the seacoasts or on the shore of a large lake. It is interior cities, wholly or partly built in river valleys, such as Dayton, Columbus, Cincinnati, Kansas City and New Orleans, that are most likely to be overwhelmed by uncontrolled freshets. To guard against flood dangers levees may have to be built, river channels blasted out and straightened, lowlands filled in or natural waters impounded in storage reservoirs. In fact, a city may find itself so situated that by its own unaided effort and expenditures it is wholly impossible to protect itself against flood dangers. It may be most economical and in some cases absolutely necessary, if a city is to be protected at all, for it to secure and exercise extra-territorial powers, perhaps for the building of dams scores of miles away in the hills.

10. Protection Against Crime and Vice.— The crowding of a great many people together into a single urban community multiplies almost infinitely the number of points of social contact, every one of which is potentially a temptation to vice or crime. Both personal interests and property interests are constantly clashing in the swirl of city life. All the weak spots in human nature are tried out. Out of these conditions grows the necessity for the police department, the magistrates' courts, the juvenile courts and the city prisons.

11. Protection Against Pestilence.— City dwellers are not only subject to cumulative dangers from the uncontrolled outbreaks of the visible forces of nature, but through their close contacts become an easy prey to the ravages of contagious and infectious diseases, ranging from chicken-pox, measles and mumps through scarlet fever, typhoid fever and diphtheria to the most terrible diseases, such as smallpox, tuberculosis, syphilis, cholera, yellow fever, bubonic plague and infantile paralysis. Without the control established through the sanitary code, the sanitariums, the hospital facilities and medical attendance furnished by the city, and without the universal vigilance of an efficient health department in educating the people in hygienic methods of living and in protecting them from the nuisances created by the carelessness of others, a great city would become a mere charnel house. It is indeed the glory of efficient modern city government that in many instances it has transformed cities from the deadliest to the safest places of abode for human beings. In certain matters relating to physical health, city governments have overcome the natural disadvantages of city life and have turned them into positive advantages.

12. Protection Against Poverty and Misfortune.— City life raises the standard of living and also increases the cost of living. Rents for even modest homes mount high. Milk and meat, fruits and vegetables have to be brought from far and pay tribute to a complex distributing organization, which means high prices to the ultimate consumers even though the original producers received little for their products. The stress of city life tends to multiply misfortunes. Those who «lose out» in the game lose more heavily and become more helpless than they do in rural communities. The result is that one of the great functions of municipal government is to provide means for succoring the poor, shielding the unfortunate, caring for the aged and giving homeless children a start in life. The performance of this function requires the maintenance of a multiplicity of public institutions, including hospitals, lodging houses, children's homes, employment agencies, almshouses, etc. Even the employees of the municipality itself have to be protected from helpless poverty in old age by means of municipal pension systems.

13. Control of Housing.—At the beginning of this article it was pointed out that the very recognition of the necessity for the incorporation of a city is pregnant with the idea that unrestricted individualism must give way to social control invading what many regard as the sacred domains of personal liberty and individual property rights. Perhaps there is no branch of municipal activity that illustrates this tendency so well as the control which comes to be more and more necessary as cities grow, over the character of the houses built for the people to live in. This control is embodied first in the building code; then in the tenement house law; then in the adoption of districting plans and limitations upon the height of buildings. The exercise of this control brings the city government, representing the public interest, into direct conflict with the most powerful individual motives. The passionate greed that seems to be developed most readily in the soul of the landlord class where the growth of a community is pouring riches into its lap, opposes with almost fanatical persistence the restrictions upon housing which are absolutely necessary to provide for every living apartment enough sunshine and fresh air, with safety from fire and disease and sufficient space for the children to play in.

14. Education.— Under whatever conditions people may live, their children in a democratic country have to be educated. The «little red schoolhouse» is one of the traditional symbols of the freedom and intelligence of America when it was a predominantly rural nation. Nevertheless, the characteristics of urban life are such as to place upon the public school system an infinitely greater burden than it has to bear in the country. With the curtailment of the opportunities for both work and play in and about the home, the functions of the public school system multiply. It is no longer sufficient for the school to teach the three R's, leaving the children to get all of their education other than book learning from other sources, but in addition to a much more complicated book learning than that deemed necessary in the little red schoolhouse of the past, the modern city school has to take care of the health of the children, to give them physical training, to control and direct their play and to teach them how to work. The school even has to assume the burden of teaching the girls how to sew and to cook and the boys how to drive nails and saw wood. Under the conditions of American city life, other educational functions are thrust upon the public schools by reason of the presence in the community of large numbers of foreign-born adults who need to be taught the English language. This involves the establishment of evening schools. Moreover, the absence of opportunity for the wholesome employment of children during the vacation periods leads to the establishment of school gardens and summer schools. Cities also have to provide great libraries with local branches and elaborate organization for the stimulation and direction of the reading tastes of the children and the young people. This multiplicity of activities comprised under the general term education places upon municipal government one of its heaviest financial burdens. The schools are always calling for more money and the importance of education, which may be termed the process of reproducing citizenship, assumes constantly a greater and greater place in the public mind. In fact, the school system in a great city becomes so overwhelmingly important through the accumulation of the subtle influences which the conditions of city life bring to bear upon children that it is hard to give adequate expression to the significance of this function.

15. Recreation.— For children recreation is a necessary part of education and the playgrounds that become necessary under city conditions are often connected with the public schools. But the alchemy of congestion has such a strange and far-reaching effect upon human beings that it becomes necessary for the community as a whole to provide and regulate in large measure even the amusements of the adult population. All cities provide public parks; many provide open air concerts; many maintain public baths and bathing beaches; some maintain athletic fields and recreation centres, provide public auditoriums and operate municipal theatres. Museums, zoological and botanical gardens, aquariums and art galleries are frequently maintained at the expense of the municipality. City life is characteristically gay. The hours of labor are relatively short and the amount of available leisure relatively great. It is a common adage that «the Devil finds mischief for idle hands to do,» and every urban community organized as a municipal corporation finds that it cannot afford to ignore the Devil's activities. Thus more and more the problem of the control of leisure presses in upon the great city for solution. The recent stupendous development of the «movies» as a means of recreation in cities and the obvious need for some community control over the character of the films exhibited, have led some advanced thinkers to propose the municipalization of recreation as the next most important step in the development of municipal functions. The advocates of this program maintain that recreation is a necessity of life for urban populations and that it should be provided as a community function and thus be removed from the realm of private greed and exploitation. Foremost among the specific measures proposed by this group of reformers is the intensive use of the public schoolhouses as meeting places and community centres.

16. Franchises and Control of Public Utilities.— Perhaps there is nothing more characteristic of urban life than the development of those co-operative services commonly called public utilities, such as water supply, gas and electric light, heat and power, street railways and telephones. The modern city as a great co-operative unit could not exist as it is without these utilities and these utilities themselves could not exist except through the use of the public streets, which are rightly regarded as the common property of all the people, the very symbols of democracy and civic freedom. In America the habit of individualism has been so strong and community life in cities has been so poorly organized and so devoid of initiative that the actual construction and operation of most of these great utilities has been left in private hands. Waterworks are an exception. Also a few cities own and operate gas plants and many of the smaller cities maintain municipal electric plants. New York and Boston have built rapid transit subways at public expense, but they are equipped and operated by private companies under long-term leases. San Francisco and Seattle have within the last few years constructed certain street railway lines which are now being operated in partial competition with the privately owned street railway systems in these cities. Baltimore, Erie and one or two smaller cities have built systems of electrical conduits which are rented out to the public service corporations having wires in the streets. In so far as public utilities have been recognized as a direct municipal function, they involve the expenditure of enormous sums of money in the acquisition or construction of plants, the maintenance of great operating departments with multitudes of employees and the collection of vast revenues. By way of illustration, the department of water supply, gas and electricity of the city of New York operates a water plant representing a total investment of about $350,000,000, employs over 2,000 persons in the operation of this plant and levies and for the most part collects over $13,000,000 per annum of water rates. So far as public utilities are still regarded as a semi-private function, their presence imposes upon the city government the heavy responsibility of granting franchises and of attempting to regulate on behalf of the general public the rates at which the people shall be served and the character and extent of this service. It is in connection with these matters that many of the most important civic struggles take place, and more and more the issues involved in the ownership and regulation of public utilities tend to affect and even dominate the policies of municipal government.

17. Municipal Revenues and Taxation.— The multiplication of the functions of government necessarily results in a tremendous increase in the cost of government. The city of New York makes annual appropriations of about $200,000,000, or nearly four times the amount appropriated each year by the state of New York. Municipal revenues are derived from many sources, but the one most important source is the taxation of land. Indeed, it is the great increase in the value of land arising as a city grows that enables it to meet the expenses incident to growth. It is the general practice in American cities to levy taxes on property, theoretically upon all property but practically for the most part upon real estate. Land cannot run away at all and buildings cannot do so without extreme difficulty. In most American cities personal property is subject to taxation but on account of the difficulty of detecting and appraising it the great bulk of personal property values escapes direct taxation. Another means of securing revenues for public improvements is the so-called special assessment or what in England is referred to as the «betterment tax.» It is the theory of special assessments that the particular improvements for which they are levied have a direct effect in increasing the land values in the vicinity and that therefore the owners of the land should pay for the improvements. Special assessments are most frequently levied for the opening, grading, paving and widening of streets and for the construction of sewers. Sometimes also they are levied to pay the cost of parks and water main extensions. Another source of revenue is the general business license tax, a form of tax quite prevalent among the cities of the South. Every city, however, collects some revenue from various kinds of license fees. In some of the States, cities get subventions from the State government, usually for the benefit of the schools. From waterworks or other utilities operated by the city, large revenues are obtained, and in some instances a city gets a great deal of money from the public service corporations through the form of franchise taxes.

18. Municipal Debt and Debt Limits.—A city's wants are never satisfied. Its needs outrun its income. Expensive improvements have to be constructed which are destined to last and be of service for many years. The citizens of a growing city hard bestead to get rich and at the same time pay the increasing cost of the government, generally feel that a portion of the burden of paying for such improvements should be passed on to the next generation, which, it is expected, will continue to have the benefit of their use. Therefore, it has been customary for cities to borrow the money required to make the so-called permanent improvements, and in times of rapid growth when the demand for additional investment is great and the expectation of future profit keen, a strong temptation arises to pile up municipal debts needlessly and to postpone the payment of expenses which in fact ought to be paid out of current revenues. The danger of municipal bankruptcy is regarded as so serious that the State seldom, even in the adoption of home rule amendments to the constitution, gives the city authorities power to incur debt without limitation. In fact, it is a well established, though not universal policy of the States, to limit municipal indebtedness by direct constitutional provisions, and where this is not the case the legislature is often given specific authority by the constitution to pass general laws limiting municipal indebtedness and sometimes limiting the tax rate. Frequently the issuance of municipal bonds is made subject to approval by a majority of the people at an election. The establishment of debt limits has in many cases proved embarrassing to cities. The exigencies of municipal development have seemed to require in many cases the borrowing of all the money that can be borrowed up to the debt limit. The real purpose of a debt limit is to keep within reasonable limits the tax burden upon property, for obviously the borrowing of money is merely the postponement of taxation. Bonds that are issued fall due after a while and have to be paid, and in the meantime interest charges add to the annual burden of the taxpayers. The fundamental purpose of debt limitation is served when bonds issued for self-sustaining activities of the city government, such as waterworks, docks, rapid transit subways, electric-light plants, etc., are exempted from the debt limit, for a city's financial strength and civic prosperity is not measured by the smallness of its debt, but by the excess of its assets over its indebtedness and of its revenues over its current obligations. A debt limit that is inflexible and gives no leeway to a city to embark upon public utility enterprises is one of the most effective means of tying the city's hands and hindering the full development of its functions. In fact, municipal ownership and operation of public utilities as an ultimate policy is quite generally recognized, but cities are prevented from entering upon the realization of this policy, or even preparing for it, by the stringent financial limitations often placed upon them. In a few States, of which Michigan and Ohio are examples, cities are authorized to acquire public utilities and to issue bonds therefor, against the general credit of the city, if this is possible within the debt limit, and if this is not possible, then against the utility property itself. The State of Washington has gone even further and permitted the issuance of public utility certificates under ordinances pledging the utility revenues, not the utility plant, to the bondholders and thus making interest charges a first lien upon the gross earnings, so that if earnings are insufficient for all purposes the city will have to come to the rescue, not through the payment of interest on bonds, but through the payment of operating expenses of the utilities. The very great additional sums paid in the form of interest where long-term bonds are issued has led to the advocacy in some quarters of the «pay-as-you-go» policy, under which non-revenue producing public improvements, if not paid for through special assessments, will be paid for directly out of annual revenues. It is urged that by the adoption of a proper program of improvements so that the expense will be spread along quite evenly year by year the city will save a great deal of money by this policy. It has been generally customary for cities to establish sinking funds when bonds are issued for the purpose of accumulating a sufficient amount of money to pay these bonds when they fall due. The difficulties and dangers involved in the management of great trust funds like these have led to the adoption in some instances of the serial bond plan in accordance with which an issue of bonds to provide funds for a specific purpose will be divided into as many parts as the number of years which are reckoned to be the life of the improvement, and equal numbers of them are made to fall due each year up to the limit of such estimated life. In connection with special assessments it is customary, in order to make the payment of the assessments levied against benefited property easy, to allow the property owner a certain period of years for completing the payment of his assessment. Under this plan he is expected to pay an equal amount each year until the whole is paid, and in the meantime the city issues so-called assessment bonds to cover the cost of the improvement, these bonds to be payable out of the assessments as they are paid.

19. Participation of Citizens in Municipal Government.—As cities grow and their functions become complex and technical it is more and more necessary that there should be permanency in the municipal service. At the same time the city government requires more and more the co-operation of all the citizens. To secure efficiency in municipal administration and to encourage intelligent young men and women to enter the public service, the merit system has been devised by which the appointments to subordinate positions are made as a result of competitive examinations and city employees are protected from arbitrary removal for political or personal reasons. Where the merit system is in vogue a special commission is established to administer the civil service laws and regulations. This is one of the most difficult tasks of municipal administration and its difficulty increases as the functions of city government increase and the number of city employees multiplies. The administrative and civic importance of the merit system becomes evident the moment we think of the vast number of men and women engaged in the city service as policemen, firemen, school teachers, clerks, inspectors and laborers. It is not sufficient, however, that the city government should be able to draw freely upon the business resources of the community for the permanent work of administration. The activities of the city touch all of its citizens in an infinite variety of ways and the success of municipal government depends upon the loyal interest and support of the community at large. Without civic intelligence and civic spirit a great city with a democratic political organization cannot maintain efficient government. Often citizens feel that the city government is a distant, unresponsive power over which they have no control. It is for the purpose of developing and maintaining active interest among the citizens themselves and of giving them the complete control over the policies of their government which democracy demands, that such devices as the direct primary, the preferential ballot, nomination by petition, the recall, the referendum and the initiative have been made use of in many American cities. The problem of how to facilitate the intelligent participation of all the citizens in municipal government remains the crucial problem of American democracy. See CITY MANAGER PLAN OF GOVERNMENT; EXECUTIVE.

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MUNICIPAL HOME RULE.— Municipal home rule is the term applied to the power possessed by many American cities to frame and adopt their own charters. It is a power which must be conferred upon municipalities by a provision of the State constitution since the courts have held with practical unanimity that a grant of home rule by the State legislature would be an unconstitutional delegation of legislative power.

The constantly increasing demand for home rule which cities in the United States are making is due to the numerous and serious evils that seem to be the inevitable result of the practically complete supremacy over municipal affairs which the legislatures enjoy in three-fourths of our States. In the absence of restrictions in the Federal or State constitution the power of the legislature over the city is absolute. Legislatures have not hesitated to exercise this power. They have withheld from cities powers necessary to their development. They have interfered directly and unjustifiably in municipal matters. They have too often treated the revenues, contracts and offices of cities as the legitimate spoils of partisan politics. The problems of municipal government and administration have been left for solution to men competent neither in experience nor training to solve them. Furthermore, the necessity under which cities have labored of seeking continuously for extensions of power or other modifications of their charters has resulted in swamping the legislative calendars with an enormous mass of business, local in significance, to the exclusion of more important matters of State-wide concern.

It is these evils which municipal home rule aims to abolish by allowing cities to deal without interference with their own affairs. It is also urged that a valuable political education is received by the citizens who assume the responsibilities of home rule, while at the same time the system tends to divorce State and local politics, a result greatly to be desired.

Municipal home rule does not, however, set the city free from all State control. A municipality is not only an agency of local self-government, but it is also a part of the administrative machinery of the State government. Complete freedom of action for the city is as undesirable in this latter capacity as it is desirable in the former. The city must serve as the unit through which must be secured the enforcement of State laws relating to health, safety and the suppression of crime, the efficient conduct of elections, the promotion of education and philanthropy, and in all these matters it must be subject to State control. The necessity for the steady flow of State revenue renders desirable restrictions upon municipal extravagance in matters of taxation and borrowing. Municipal home rule, therefore, means merely the right of the city to control its own destinies in matters municipal or local in significance and not the right to interfere with those problems which must concern the welfare of the State at large. To define accurately which functions of the city are municipal in character and which have this State-wide significance has been found to be a practical problem of great difficulty.

The home rule provisions of State constitutions vary in character. Sometimes home rule is given to all cities, sometimes only to those of a certain population. These provisions have usually been self-executing, but in a few cases the legislature has acted for the purpose of making the grant of home rule effective. Usually the home rule charter is framed by a popularly elected charter commission and becomes effective upon the approval of a majority of those voting upon it. There are, however, cases in which an extraordinary majority of the voters is required or even the subsequent approval of the governor or legislature. These special restrictions are exceptional. Home rule charters commonly provide for their own amendment by means of initiative petition. They are not subject to change at the hands of the State legislature.

In 1918, 12 States in the United States had constitutional provisions giving some or all of their cities municipal home rule. These States and the dates of the home rule grant in each are as follows: Missouri (1875); California (1879); Washington (1889); Minnesota (1896); Colorado (1902); Oregon (1906); Oklahoma (1908); Michigan (1908); Arizona (1912); Ohio (1912); Nebraska (1912); Texas (1912); Consult Arndt, 'The Emancipation of the American City' (1917); Beard, 'The American City' (1912); Fitzpatrick, E. A., 'Experts in Municipal Life' (1916); Goodnow, 'Municipal Home Rule' (1895); McBain, 'The Law and Practice of Municipal Home Rule' (1916); Munro, 'The Government of American Cities' (revised, 1916).

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MUNICIPAL HOUSING. See Tenement House.

MUNICIPAL LAW. In England and America municipal law means the national law or the law of the land, both public and private, in contradistinction to external or international law. The municipal law of America is derived from that of England, which has had a continual development extending over 13 centuries. Largely influenced at times by Roman law, both civil and canon, it has retained somewhat the character of the Teutonic system in which it had its origin. By English colonists it reached all quarters of the earth and in the modern world it is the great rival of Roman law. For the first five centuries after Christ Britain was ruled by Roman imperial law after which it was banished by the invading hordes from the coast of the North Sea. With these came their tribal customs, which we find formulated in the «dooms» promulgated by the English kings from the 7th to the 11th century and by the Danish ruler of England, Canute. These laws, more properly «folk-laws,» are largely made up of provisions for punishing breaches of the peace and setting fines as penalties for private wrongs. In the 8th and 9th centuries many of the Roman Church laws were introduced, especially the laws of marriage, deeds and wills, but even these were largely modified to conform to local usages and custom.

With William the Conqueror the law of the Franks, also Teutonic in origin, but highly developed in Normandy, was introduced to Saxon England. The two systems were now in practice — the Anglo-Saxon for the English and the Norman for the conquerors — while special enactments after the Norman spirit governed the interrelations of the two races. The two systems were gradually merged with the Norman law taking precedence because of its technical superiority. Down to the days of the Tudors the language of the laws was Norman-French. The common law was developed partly by legislation (royal charters, provisions, assizes, statutes), but mainly by judicial decisions. Ecclesiastical law still exerted considerable influence, having received independent jurisdiction from the Conqueror. This jurisdiction churchmen sought to extend, but were checked by several statutes. In family law, however, they remained supreme as also in the administration of estates, and from the canon law are mainly derived these branches of modern English law. Judicial law-making sprang up toward the close of the Middle Ages, some judges boldly overriding the common law by virtue of the powers they believed as inherent in the Crown. Since the 18th century, both in England and America, the courts have practically confined themselves to administering the law as established by previous decisions. On the Continent of Europe the term municipal law has been often employed to designate a local law, as of a city or province, in contrast to the national body of law; at present the term usually designates a city law in contrast to the national law. In the United States within recent decades a great body of legislation concerning cities has grown up, and the term municipal law has come to be the usual designation of such legislation. See Equity; Common Law; Canon Law; Municipality; Cities, Government of; and consult Brunner, Heinrich, 'Quellen des Englischen Rechts' (Eng. trans. by Hastie, Edinburgh 1888); Maitland, 'Materials for English History' (in *Political Science Quarterly,* Vol. IV, 496, 628); Stephen, 'New Commentaries' (7th ed., London 1874). For American law consult Kent, 'Commentaries' (12th ed., Boston 1873); Holmes, O. W., Jr., 'The Common Law' (ib. 1881); Carter, 'Codification of Our Common Law' (New York 1884); McQuillin, Eugene, 'Treatise on the Law of Municipal Ordinances' (Chicago 1904); Whitlock, Brand, 'On the Enforcement of Law in Cities' (Indianapolis 1913).

MUNICIPAL LEAGUE, National, an interstate organization, made up of individual members and affiliated with State and local associations for the purpose of promoting better government in cities. It was founded in New York in 1894; the league is non-partisan in politics, but seeks to promote its ends by the enactment of sound municipal laws, charters, etc., by the election of able and efficient men to public office, by correcting abuses in the existing administration of city departments, as police, vice control, etc. Its annual conferences are of great value in that it promotes the exchange of views between municipal workers and experts. At the 1915 meeting a model charter was issued, which has since been adopted by several municipalities. At present there are committees on franchises, State municipal leagues, city management, municipal information and county government. Consult 'Proceedings of the National Municipal League' (Philadelphia, annually, 1894–1910) and the *National Municipal Review* (Baltimore, bimonthly).

MUNICIPAL OWNERSHIP is a term broad enough to include the ownership by a municipality of any form of property. Usage has limited its meaning, however, to the ownership by cities of certain well recognized types of public utilities or services such as water, gas, electricity and street railway transportation. Municipal ownership is usually thought of as including the municipal operation of the utilities owned, the ownership and operation being popularly regarded as inseparable. It is, however, not uncommon for municipally owned utilities to be leased and operated by private corporations. In the following paragraphs municipal ownership and operation will be discussed as a single policy and system.

In recent years the number and variety of enterprises to which municipal ownership has been extended throughout the world have greatly increased. This extension has been more striking in Europe than in the United States. A survey made in 1906 showed that in the towns and cities of Prussia 33 different kinds of undertakings were in public hands. Needless to say most of these were enterprises which are almost universally regarded in this country as improper fields for municipal activity. The following may be mentioned as examples: abattoirs and stockyards, warehouses, breweries, hotels, canning factories, mines, bakeries, mills, fisheries and livery stables. In the United States municipal ownership has usually been confined to undertakings which have some or all of the following characteristics: (1) those which are natural monopolies, in which competition is either impossible, impracticable, or highly inconvenient, such as supplies of water, gas or electricity; (2) those which are dependent upon securing special privileges and rights from the public, such as the right of eminent domain and the right to occupy the streets with tracks, pipes, poles and wires; (3) those which produce commodities or services of which the city itself must necessarily be a heavy consumer, such as water for various municipal purposes and electricity or gas used for public lighting; (4) those which directly concern the health of the city or its general safety, as water, the purity of which directly affects the public health and which is also necessary for fire protection and street flushing; (5) those which subserve the public welfare directly but which private capital cannot always be relied upon to provide at sufficiently low cost, such as public recreational facilities of various kinds or commercially unprofitable transportation facilities such as some of the municipal ferries in New York. There is a marked tendency in this country to emulate the cities of Europe and enlarge the scope of municipal ownership. Recent years have witnessed experiments in the direction of the municipalization of ice plants, fuel yards, theatres and opera houses, although in none of these cases has the city made any effort to monopolize the field. It seems clear that we may expect a continued expansion in the field of municipal ownership. At present however, municipal ownership in the United States is confined in the main to the systems for supplying water, light, power and transportation.

Cities which have embarked upon municipal ownership ventures have almost always been led to do so by force of certain concrete facts existing in individual cases rather than by any dispassionate and logical analysis of conflicting arguments. It has required no argument to convince indignant citizens that under private ownership of the city's vital utilities rates were high, service was poor, equipment was out of date, stock was watered and that public utility corporations were an influence for evil in local government and politics. Efforts to correct these abuses by legislation or by administrative control have usually proved ineffective and municipal ownership has been resorted to, frequently without much examination of the arguments for or against it, on the assumption that it would succeed where all else had failed. And it may be said, whatever criticisms may be raised by persons looking on from the outside, that the cases in which municipal ownership has proved unsatisfactory to the cities which have adopted it are few indeed. It should not be inferred from the foregoing that there has been any dearth of arguments on either side of the question of municipal ownership. In spite of the extension of municipalization already alluded to it remains one of the most debatable and hotly contested issues in the whole field of municipal policy. The arguments in favor of municipal ownership may be summarized as follows: (1) A broadening of the scope of municipal activity will stimulate interest on the part of the citizens in civic affairs by giving them a direct and immediate concern in what the city is doing. Civic pride and interest will produce civic efficiency. At the same time a higher grade of public officer will be attracted into the service of the city by the necessary creation under municipal ownership of places of dignity and importance. (2) The city will enjoy better service from publicly owned and operated utilities than from those privately owned. The primary motive of the public utility corporation is to make a large profit, frequently on watered capitalization. Expenditures made to improve the service rendered mean a reduction in these profits and are, therefore, not made when they can be postponed or avoided. Under municipal ownership the ambition to make profits is absent. The city could afford to invest the profits of the business in necessary improvements of service. It could make needed extensions of service into undeveloped parts of the city at a temporary loss which could be met from the proceeds from the rest of the system. It is untrue that the city would display less initiative than would private capital in the management of these enterprises. In fact the reverse would be true. Experience has shown that the desire to remain in the undisturbed possession of generous revenues has completely killed the business initiative of many public utility companies, which, secure in their monopolistic franchise rights, have shown little or no enterprise. (3) Municipal ownership has been shown by experience to be financially successful. It gives the city a substantial surplus or enables it materially to reduce rates and in many instances it has done both. The case of Glasgow, Scotland, is frequently cited. The city took over the horse car lines in 1894. The lines have been electrified and extended from 64 miles to 197 in 1913. The number of passengers has increased from 57,104,647 to 311,480,086 during the same period. The fares have been reduced. Under a system of zoning the average rate per mile is .44d under municipal management as against .89d under private control. The hours of labor of employees have been reduced and their wages raised. At the same time the enterprise has proved a source of income to the city and in 1913 after deductions for operating expenses, depreciation, interest on capital, sinking fund charges, etc., there was a balance of £33,000 to be turned over to the «Common Good.» San Francisco embarked upon the municipal ownership and operation of about seven and one-half miles of street car line in 1913. The end of the first year showed a net profit of $45,000 as well as better service, and improved conditions of labor. The mileage has since been increased and promises to keep on growing. Examples of this sort could be multiplied at length. (4) Municipal ownership would remove one of the most fruitful sources of corruption in municipal government. Bribery and dishonesty thrive where there are privileges to be dispensed and public service companies have not hesitated to resort to these methods in their efforts to ward off unfriendly control and regulation or to secure new franchises and concessions. Even when actual corruption has not been resorted to these private interests have felt the need of building up a political influence for the purpose of protecting themselves from all sorts of governmental interference. Municipal ownership would strike at the root of this evil by removing the incentive and opportunity for corruption. It is furthermore urged that under an adequate civil service system municipal ownership would entail no danger of a political machine composed of the employees of the publicly owned enterprises. (5) The municipalization of public utilities would give the city the power to avert strikes and labor troubles which under private ownership occur so frequently and with such disastrous results to the public welfare and convenience. Lacking the motive of exorbitant profits the city would be able to meet the reasonable demands of its employees fairly and improve the conditions under which they work.

The following arguments are advanced by the opponents of municipal ownership: (1) It is a fundamental mistake for the government to engage in enterprises which can satisfactorily be carried on by private capital and management. The municipalization of public utilities is socialistic and subversive of sound economic doctrine. (2) The weakness, inefficiency and corruption which have been so prevalent in the government of American cities demonstrate conclusively the incompetence of municipalities to assume the burdens and responsibilities of municipal ownership. Under such a system, with numerous men to be employed and costly materials to be purchased the opportunities for dishonesty and mismanagement would be far more numerous and alluring than at present. (3) Even if cities could be kept free from corruption they would still be unequal to the problems of efficient administration of so complex an undertaking. The city would be assuming in relation to its public utilities the position of owner, consumer and public, and it is highly probable that the city's interests as proprietor of the enterprise would be sacrificed to its interests as consumer and as the public. The almost universal popular prejudice against paying high salaries to public officials would prevent the securing of thoroughly competent men to manage these businesses for the city. At the same time the pressure in the direction of securing sinecures in the public management of these systems coupled with the fact that people who work for the public are usually less industrious and efficient than those who work for private employers would tend to impede further the efficiency of municipally owned services. (4) Municipal ownership would so overburden the municipality with duties that not only would the operation of the public utilities be less satisfactory than under private control but also the efficient conduct of the other affairs of the city would suffer by being over-shadowed and crowded out. (5) Serious difficulties would arise from the creation of a large body of municipal employees who would enjoy an enormous potential political influence. They would be a ready-made nucleus for a powerful political machine of great solidarity. In European countries this problem has sometimes been met by the disfranchisement of the employees of the city but it will not be seriously argued that such a solution would be open to the American city. (6) Experience in many instances has shown conclusively that municipal ownership is a failure in operation. In this connection the experience of Philadelphia in the public ownership and operation of her gas plant is usually referred to. The city took over this utility in 1841 and retained it until 1897 when it leased the plant to a private corporation. The history of the public ownership and control of this enterprise is a story of almost incredible corruption and mismanagement. Other less conspicuous instances are cited of cases in which, due to mismanagement or financial failure, municipally owned plants have been turned back again if not to private ownership at least to private operation. It is pointed out furthermore that not only has the success which has attended municipal ownership in Europe been greatly over-rated but that, even if admitted, it does not serve as an argument for municipal ownership in this country since the determining conditions surrounding such enterprises are strikingly different here from what they are abroad. It must not be assumed that the argument for or against municipal ownership is equally strong in the case of every type of public utility. There are special considerations in connection with certain enterprises which have a bearing upon the desirability of municipal ownership which may be briefly commented upon. The argument in favor of the municipalization of the city's water supply is stronger than for the municipal ownership of any other service or utility. Many critics who oppose the system generally favor its application to waterworks. There are several reasons why this is true. First, the health of the city is dependent upon an adequate supply of pure water. The city should control the conditions which relate so directly to its disease and death rate. Second, the city itself is the largest consumer of water, taking usually about 10 per cent of the entire supply. The city must have water for fire protection, sewers, street sprinkling and cleaning, public buildings, parks and fountains. Third, many social, industrial and business enterprises and interests depend upon the adequacy and cheapness of the water supply. The prosperity of the city may be deeply involved in the policy which controls the supply and price. As a result of these considerations a large majority of the waterworks plants here and abroad are under public management. In 1915, 156 of the 204 cities of the United States having a population of 30,000 or more had municipally owned water plants. Only seven of the 62 cities of 100,000 population or more and not a single city of 300,000 or over still allowed their waterworks to remain in private hands. The two most interesting cases of publicly managed water systems are, perhaps, those of New York City and Los Angeles. The new Ashokan reservoir and aqueduct opened in 1917, brings water for a distance of more than 100 miles to the city of New York and when entirely completed will have a capacity of 500,000,000 gallons per day. The Los Angeles system will bring water from the mountains 260 miles away. The administration of municipally owned waterworks seems to have been satisfactory. It should be remembered, however, that apart from the gigantic engineering projects just mentioned there are no serious technical problems connected with the systems to test severely the administrative capacity of the city.

The increase in the number of municipally owned lighting and power plants in the United States is much less marked than in the case of waterworks. Here private ownership is the rule and not the exception. Twenty-one of the 204 cities having a population of 30,000 or more in 1915 had municipal ownership of commercial light and power. Some others supplied merely their own needs for public lighting. It has been estimated that of all the towns and cities of this country over 1,500 have electric lighting plants under municipal ownership and management but that more than twice that number still retained private ownership and control. It is usually in the smaller municipalities that public ownership is found. The most important exceptions are the cities of Chicago and Detroit. It will be noted that, with the exception of public street lighting, the supplying of electricity and power bears no intimate relation to public health or safety while at the same time the business itself is highly technical in character. These facts doubtless have some bearing upon the limited extent to which electric lighting has been municipalized. Municipal ownership is still less common in the United States in the field of municipal gas supply than in that of electric light and power. Wheeling, W. Va., seems to have had the first municipal gas plant, the policy of municipal ownership being instituted in 1851. At the present time the total number of such plants under municipal management is less than 40. Only five of the 204 cities having a population of 30,000 or more in 1915 have municipally owned gas plants. Of these Richmond, Va., is the largest. It is probable that municipalization in this field has been thus limited in extent because of the costly equipment necessary to the business as well as the difficult scientific problems incident to its conduct. In the field of municipal ownership of transportation facilities there have been no important ventures in this country. It has been noted above that San Francisco has recently undertaken the municipal ownership and operation of one of its street car lines. New York and Boston own their subways but they are operated by private corporations. There are provisions in many modern franchises which will make the acquisition of the street car lines by the city possible at some future time. It is highly probable that the next few decades will see considerable expansion of municipal ownership and operation in this field. Thus far American cities have been deterred from embarking upon such ventures not only by the difficulties and complexities of administration but also by the financial obstacles such as municipal debt limits which have made it impossible for municipalities to acquire the ownership of such costly properties.

The foregoing paragraphs point to the conclusion that the practicability and desirability of municipal ownership vary with the kind of public utility to which it is applied and that the relation of such services to the public health and safety, the inherent difficulty and complexity of their management, and the amount of capital investment needed for the enterprise are all factors which have a direct influence upon cities in determining the advisability of venturing into the field of municipal ownership. It has not yet become profitable nor illuminating to multiply statistics regarding municipal ownership in American cities for two reasons. The first is that the facts regarding private ownership which should be available for purposes of comparison are usually withheld by private corporations which do not encourage such intrusion into their private affairs. The second reason is that municipal accounting in this country is so chaotic, confused and non-uniform as to render almost meaningless most of the comparative financial statements which have thus far been issued. There are few fields of inquiry in which less reliance may safely be placed upon published statistics. This situation will doubtless be remedied in time and even now some reliable facts regarding municipal ownership are being collected and published from time to time by the United States Census Bureau.

In Great Britain municipal ownership has been developed far more extensively than in the United States. The public ownership of waterworks is practically universal and, although profits are not primarily aimed at, these plants seem to be making a fair net return to the public treasury. There are a large number of municipally owned gas plants, between 200 and 300, including those in about half of the largest cities. The municipalization of electricity and power is even more common. These ventures have proved of some profit to the city and have at the same time frequently made possible reductions in the rates of service. The most striking facts regarding municipal ownership in Great Britain, however, are those regarding the tramways. In 1914, 171 of the 286 tramways in British cities were municipally owned and 115 remained in private hands. The public management was proving profitable in practically every case. The reason why municipal ownership should be so prevalent in the local transportation systems of Great Britain is found in the extreme rigor of governmental control exercised over the public utility corporations as well as the subsidies these private companies were obliged to pay into the public treasury. The result was so marked a reduction of monopoly profits that private corporations in many cases were not unwilling to dispose of their businesses at a fair figure.

Several striking facts may be noted regarding the municipal ownership of public utilities in Germany. First, the process of municipalization has gone further in that country than elsewhere in the world. This is true both as to the kinds of projects publicly owned and as to the extent of the public ownership of any one utility or service. In 1911 the statistical report upon German municipalities showed that of 87 towns having a population of over 50,000, 77 owned their waterworks, 72 gasworks, 67 electrical works and 47 tramways. There are upwards of 40 kinds of services which are in the hands of the municipality in some or all of the German cities. In the second place, the German cities systematically aim at profits in the management of publicly owned enterprises. Practically all German cities use their public utilities as a means of reducing taxes. In 1912 the gas plant in Berlin gave a surplus of over $2,000,000 to be applied in this way. In the third place, there are some German towns in which the profits from publicly owned utilities and services are so large that they defray all the costs of government and pay yearly dividends to the individual citizens. Cases in point are the small towns of Klingenberg, Seeburg and Enkirch.

It may be said in conclusion that while municipal ownership will remain a debatable policy there seems to be an irresistible movement throughout the progressive countries of the world in the direction of its adoption. While this movement may be less rapid in the United States than elsewhere it is worthy of note that in many instances the threat of municipal ownership has had the salutary effect of producing better conditions in the administration of privately owned public utilities.

Bibliography.— Beard, ‘The American City’ (1912); Bemis, ‘Municipal Monopolies’ (1899); Darwin, ‘Municipal Trade, The Advantages and Disadvantages’ (1903); Dawson, ‘Municipal Life and Government in Germany’ (1914); Fairlie, ‘Essays in Municipal Administration’ (1908); Howe, ‘European Cities at Work’ (1913); Howe, ‘The British City’ (1907); James, ‘Municipal Functions’ (1917); King, ‘Regulation of Public Utilities’ (1912); Meyer, ‘Municipal Ownership in Great Britain’ (1906); Munro, ‘Principles and Methods of Municipal Administration’ (1916); ‘Municipal Year Book’ (British, annual); ‘National Civic Federation, Municipal and Private Operation of Public Utilities’ (1907); Parsons, ‘The City for the People’ (1901); Porter, ‘The Dangers of Municipal Trading’ (1907); Rowe, ‘The Problems of City Government’ (1908); Shaw, ‘The Common Sense of Municipal Trading’ (1904); Stevens, ‘A Bibliography of Municipal Utility Regulation and Municipal Ownership’ (1918); United States, Bureau of The Census, ‘Financial Statistics of Cities’ (1915); Whinery, ‘Municipal Public Works’ (1903); Zueblin, ‘American Municipal Progress’ (Revised, 1916).

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MUNICIPAL REFORM ACTS, English. The body of laws passed by the English Parliament since 1833 dealing with municipal franchises, suffrage charters, etc. In the 14th and 15th centuries the municipal suffrage fell gradually more and more into the hands of restricted bodies of men. Notorious abuses crept into the system and the Parliamentary Reform Act of 1832 left the municipalities well nigh untouched as regarded charters, suffrage, etc. In 1833 a royal commission made an extended report on existing abuses, showing that most municipalities were ruled by venal cliques, funds were wasted or worse, public service was negligible, municipal courts were corrupt, etc. New legislation based on the commission's report was enacted in 1835 known as the Municipal Corporation Act, under which 178 boroughs were reformed and about 125 others created. The more flagrant abuses were corrected and means were provided by which other abuses might be eliminated. The franchise was extended to all property owners and occupiers of property of £10 ($50) valuation or over and a uniform system of administration was provided under which an elected council of a size proportionate to the population of the borough was made into a bicameral body, the upper chamber to be composed of aldermen elected by the council. The mayor was to be chosen from among the councilors or aldermen by vote of both these bodies. In great part these features still constitute the municipal constitution of England, although various modifications have been made by subsequent act of Parliament. The Consolidated Municipal Code was passed in 1882 and six years later cities and towns with 50,000 or over population were constituted distinct counties, with municipal councils discharging the functions ordinarily exercised by county councils. Consult Chalmers, M. D., 'Local Governments' (London 1883) and Shaw, 'Municipal Government in Great Britain' (New York 1901).

MUNICIPAL SAVINGS BANKS. See BANKS AND BANKING — WORLD'S SYSTEMS (Article 3).

MUNICIPAL WATER SUPPLY. See HYDRAULIC ENGINEERING; MUNICIPAL GOVERNMENT; WATER SUPPLY.

MUNICIPALITIES. Municipalities are as old as civilization itself. The story of the nations of antiquity that flourished in the valleys of the Nile, Tigris and Euphrates is in large part the narrative of what went on in the imposing cities of Thebes, Memphis, Babylon and Nineveh. History gives us little accurate knowledge of these populous centres of the ancient world and the student of municipal government gains little from a scrutiny of the autocratic systems by which they were ruled.

Greece.— Real city life may be said to have been born in Greece. Largely due to geographical and topographical conditions which made community isolation inevitable, ancient Greece never became a unified nation. It was merely a geographical term applied to a group of independent, usually self-governing cities with the areas of land adjacent to them. The Greek city-state was the sole unit of government. The city was the state and the state was the city. A man was a foreigner in any city but his own. There were no distinctions between the duties and functions which in modern times we call national or state and those which were municipal. It is therefore perfectly proper that we should derive our words «politics,» «political,» and the similar terms by which we describe our public policies, institutions and concerns from *polis,* the Greek word for city. The Greek cities differed widely in government. In Sparta the governing power remained consistently autocratic or oligarchical, while in other Greek cities, notably Athens, the form of government fluctuated between autocracy and democracy.

Rome.— Early Italian history, like that of Greece, is the record of the development and struggles of a large number of city-states. The history of Rome as a nation is the history of the conquest or establishment of numerous cities bound together into one gigantic, unified system by the dominating power of Rome. As in Greece, city life and national life tended to merge. The government of the city of Rome itself, beginning with monarchy, progressed through various stages of democracy and representative government which were never completely lost even under the autocratic forms of the empire. There was little in the government of the cities outside of Rome, however, which could be called truly popular, and such democratic features as existed in the earlier period tended to diminish or disappear as the empire became more centralized. The political and civil rights conferred by Rome upon these tributary cities were usually made the basis for the imposition of heavy taxation. It is from the word *municipium* applied by the Romans to these dependent and partially self-governing cities that we derive our word municipality. In complexity of organization and in diversity of functions it may be safely said that municipal government and life at Rome at the height of its development rivaled that of the modern metropolis.

Mediæval Cities.— During the «dark ages» municipalities seem to drop out of sight for the time being. The remnant of their powers and functions which was not lost in the general chaos was taken over largely by the Church. The development of the feudal system in Europe, beginning with the 10th century, was destined to exert an important influence upon the life and position of municipalities. Its immediate result was a diminution of their already weakened power. The feudal lord who lived upon his estate in the country held the cities within his domain as vassals, exercising over them the same feudal prerogatives as over the individuals on his land. In spite of feudal oppression the mediæval cities prospered as centers of trade and commerce. With prosperity came wealth and with wealth came the power to bargain or to fight with the feudal barons. Many of the larger cities of Italy, i.e., Florence, Venice, and Pisa, were able to purchase something like independence, while the cities of northern Europe more frequently freed themselves by the sword. This was true of the powerful free cities of northern Germany, which during the 11th and 12th centuries cemented their commercial interests in the formation of the Hanseatic League. When the struggle for municipal rights was won either by barter or in battle the cities secured the fruits thereof in a written treaty of peace or bill of rights called a *charter.* These charters, limited as they frequently were in the scope of the municipal freedom they guaranteed, may be said to have laid the foundations for modern constitutional government.

England.— English municipalities were subjected to the same feudal oppression which the more prosperous towns on the Continent suffered. They were not at first incorporated and had few political or civil rights and little if any self-government. They were small in area and population. London which was the metropolis then as now had about 40,000 inhabitants at the beginning of the 15th century. As feudalism lost its grip these towns or boroughs became incorporated, and gained in power and independence usually because the extension of privileges made easier the collection of taxes by the feudal lord. It was for this mercenary reason that Edward I gave the English boroughs representation in the historic national parliament called in 1295. The political power which the cities thus acquired was of great potential value to the Crown in the struggle it was then waging with the nobles. The establishment of the rule that no corporation was lawful without royal sanction gave the Crown the chance it desired to dominate municipal affairs and control the selection of the borough representatives in Parliament. Finding that popular elections afforded an uncertain basis of control, the Crown finally built up a sufficiently subservient municipal organization by creating a mayor and council selected in the first instance by the king and endowed with the power of self-perpetuation. It was not until the passage of the Municipal Corporations Reform Act of 1835, made necessary by the inefficiency and corruption in municipal life, that English city government ceased to be oligarchical and took on the general form it now bears — that of a representative governing body holding office for short terms and elected by popular vote.

United States.—American municipal history dates back to the chartered municipal corporations established in the English colonies in the 17th and 18th centuries. The oldest of these charters seems to have been the one given to New York in 1686. The charters were granted by the provincial governors and in the main the government consisted of a popularly elected board of councilmen and aldermen and a mayor appointed by the governor. Although not originally subject to the control of the colonial legislatures these municipalities finally became so and found itself under the necessity of applying to the legislatures for additional grants of power, especially in the matter of taxation. After the American Revolution the state legislatures assumed that position of complete supremacy over American cities which they have ever since held.

Relation Between the City and the Central Government — England.— While cities are the organs for local self-government their functions do not end there, and the modern municipality finds itself bound to the state or nation within which it lies by a complex web of political, legal and governmental ties. The place of the city in the English administrative system may be sketched as follows: The city is a corporation created by Parliament. The municipality which desires a charter petitions for it and its petition is granted or rejected in accordance with a procedure which assures a fair consideration of the merits of the case. Needed amendments to the charter must be secured in the same way. The charters thus granted are similar in general outline but vary widely in the details of municipal organization and power. Powers are usually conferred upon English cities which are broad in scope and which create a system of local legislative autonomy. While Parliament remains the ultimate source of all English municipal authority there has never been a disposition on its part wantonly to interfere in the affairs of single cities after the fashion of American legislatures. This is due partly to the control over and responsibility for legislation in Parliament which is centred in the cabinet, making «log-rolling» and «pork-barrel» legislation impossible; it is also due to the essential nature of English municipal organization, politics and traditions which have prevented the English city from becoming the prey of partisan exploitation. Not only does the English national government exercise legislative power over the English city in the manner described but it also exerts an administrative supervision over it. The most important agency for this central administrative control is the Local Government Board. In a wide range of matters connected with municipal debts, municipal ownership, poor relief, and health, it is necessary for the city to secure the approval of this board for its projects. Administrative supervision of English cities is not centralized in one department however, but the Board of Education, the Board of Agriculture, the Board of Trade and the Home Office have varying degrees of authority over the municipal activities falling within their respective jurisdictions. The result of this central administrative control has been wholesome. There has been no serious infringement of municipal autonomy but a valuable check on municipal extravagance and inefficiency. The administrative agencies mentioned have been given wide powers and have been able to settle many of the questions of municipal administration and power which in the United States have been fertile sources of ill-advised interference by the legislature in municipal affairs. In short, the English system may be said to be one of legislative decentralization, in view of the whole legislative power given to English cities, and administrative centralization.

United States.— In this country the opposite principle prevails, that of legislative centralization and administrative decentralization. Many of the most serious abuses in American municipal life have been due to the practically unrestrained and frequently abused power of the State legislatures over cities. Only too frequently has the American city been the prey of legislative exploitation and corruption. State legislatures have interfered in all kinds of municipal affairs. They have destroyed, enlarged or abridged municipal charters; extended or narrowed boundary lines; abolished municipal offices in order that those created to replace them might be available as party spoils; imposed upon cities burdensome debts against their will; bartered away municipal franchise privileges; and in countless ways contributed to the depravity and inefficiency which have too frequently been the shame of American cities. Among the efforts which have been made from time to time to prevent the abuses of special legislation affecting our cities the following may be mentioned: First, a general prohibition of such special legislation. Practically every State now forbids the incorporation of cities except by general law. The criticism urged against forbidding all special legislation is that the prohibition, if broad enough to cover adequately the abuse of special legislation, does not leave power to deal with the peculiar problems of individual cities. Second, the classification of cities with the requirement that laws must apply to all the cities of the same class. It has been found easy to create classifications in which each important city was in a group by itself. Third, general municipal codes, like that of Ohio in 1902, under which all cities are governed in accordance with a general and uniform scheme. This plan has not been found elastic enough to meet the needs of cities of varying size. Fourth, the municipal veto, by which a city is given the right to ward off legislative interference. This veto may be absolute, as in the case of Chicago, or it may be merely suspensive, as in the case of the cities in the State of New York. Fifth, the optional charter plan. This creates a series of model charters providing different forms of city government suitable to varying municipal conditions. A city may select whichever form it chooses and be governed under it. Sixth, municipal home rule (q.v.), which is now commonly regarded as the only adequate remedy for the evils of State interference in municipal affairs. There is in the United States practically no State administrative control over cities. There are no State administrative agencies which supervise municipal activities and there seems to be little disposition to create them. In a few instances there has been some degree of administrative supervision in the matters of education, health, civil service, elections, public utilities, and liquor sales, but these cases are very rare. There have been instances in which the State has taken direct charge of various municipal functions, such as police protection, and operated them by state appointed officers, but this is very different from central administrative supervision over municipal activities. It is possible that some scheme comparable to the one in England already described would aid us in the solution of some of our problems of municipal administration.

Municipal Charters.—Allusion has already been made to the charter of the municipality which serves the purpose of a constitution. It is the document which the city receives from the State legislature setting forth the form of municipal organization, the measure and limits of the city's power. It is granted by the legislature either by special act or in accordance with general laws, or, in the case of cities enjoying home rule, it is framed by the city itself. There are at least two respects in which the charter of a municipality differs from that of a private corporation. A private corporation becomes such by its own volition and no group of citizens can be compelled to incorporate against its wish. The State, however, has power to organize a community into a municipal corporation against the protest of every inhabitant of the district involved. In the second place, a charter given by the State to a private corporation is a solemn and binding contract which without mutual consent cannot subsequently be revoked or altered by the State, the obligation of which cannot be impaired without violating the provisions of the Federal constitution. The charter of a municipality is not a contract and the legislature, unless restrained by special provisions of the State constitution, may amend it or abolish it at its discretion. It stands on the same footing as any other piece of legislation.

Municipal Powers — Character and Construction.— No rule of law is more firmly established in this country than that the powers of a municipality are not residuary but are delegated and limited. These powers may be found in the charter of the city, in the general laws of the State, or in the self-executing clauses of the constitution; but they must be found positively set forth somewhere. Not only are municipal powers delegated but they are also construed with utmost strictness. No clearer or more adequate statement of the character and extent of the powers of the American city can be found than the classic words of Judge Dillon: "It is a general and undisputed proposition of law that a municipal corporation possesses and can exercise the following powers and no others: First, those granted in express words; second, those necessarily or fairly implied in or incident to the powers expressly granted; third, those essential to the accomplishment of the declared objects and purposes of the corporation — not simply convenient, but indispensible. Any fair, reasonable, substantial doubt concerning the existence of power is resolved by the courts against the corporation, and the power is denied."

Ordinance Power.— One of the powers which is invariably granted in a municipal charter is the power to pass ordinances which shall have the effect of law. The legislature may not, under our State constitutions, delegate its legislative power; but since a city is regarded as an administrative subdivision of the State the courts have uniformly held it to be proper to endow it with a share of the State's legislative power. The power to pass ordinances is hedged about by many limitations express or implied, which may be summarized as follows: First, where the procedure to be followed in passing an ordinance is set forth in the charter it must be rigidly adhered to or the ordinance will be held void. Second, ordinances must not be passed in excess of the power delegated to the city. Third, there must be no violation of the provisions of the National or State constitutions or statutes. Fourth, since every power is granted to a municipality under the implied condition that it will be reasonably exercised, any ordinance will be held void which is regarded as unreasonable by reason of its being oppressive, discriminatory, unduly restrictive of trade, in contravention of common right or public policy. The invalidity of part of an ordinance does not vitiate the entire ordinance if the valid and invalid portions are separable.

Power of Taxation.— The power of the American city to tax must be given either by express or implied grant. It is usually specifically conferred in the charter, but if not it will be implied from the grant of other powers for the exercise of which revenues are necessary. When not limited by the provisions of the State constitution the State legislature has complete control over the city's power of taxation. It may in its discretion extend, curtail or revoke it in general or with reference to special taxes. It is subject in the exercise of this power to one restriction. It may not take away the power of a city to tax when such taxing power is the only means of paying an existing debt. The amount of the taxes which a city may raise for municipal purposes may be left to its discretion, but very commonly the city tax rate is limited either by the statutes or constitution of the State. The city's power to tax, like that of the State, can be exercised only for public purposes, a limitation which does not interfere with the ordinary activities of the city but which has raised some difficult problems in connection with some of the newer commercial activities of American municipalities. The rules governing the procedure of assessment and collection of municipal taxes are usually set forth in the city charter and must be strictly followed. The courts will compel a city against its will to exercise its taxing power to satisfy the claims of its creditors.

Police Power.— The power to pass ordinances for the protection of the public health, safety, morals and general welfare of the municipality is commonly conferred upon cities by express grant. It may be implied, however, from a general grant of power to pass ordinances. It is under this authority that municipalities make enactments relative to the preservation of peace and order, sanitation, fire protection, regulation of amusements and occupations and the control of vice. When exercised by the city the police power is subject to all the usual constitutional restraints against arbitrary and discriminatory enactments, and in addition police ordinances are held void if they are unreasonable even though they violate no constitutional clause. The city is incapable of parting with its police power by the making of any grant, concession, exemption or contract. Its police ordinances may deal with subjects already covered by State law provided the ordinance does not conflict with the statute. The power to pass police ordinances carried with it by implication the authority to establish and enforce reasonable penalties. Such ordinances may be enforced either by penalties inflicted upon individuals or by summary destruction of private property which is held to be a public nuisance.

Municipal Contracts.— The power to make contracts is given to all municipalities by express grant or by implication. Such contracts have the same general legal character as contracts between individuals but the city must be exceedingly cautious not to exceed its power. If the procedural requirements in the city charter are not complied with the contract is void. Where cities enter into contracts for the securing of services or goods it is commonly required that the city must call for sealed bids based upon plans and specifications and that the contract must be let to the lowest responsible bidder. If it can be clearly shown that a city did not have the requisite authority to make a given contract such a contract is completely void. Cities are, however, bound by the principles of common honesty and in cases where its contracts are illegal because of hidden defects of procedure or non-compliance with other formal requirements the city may still be bound. It may elect to ratify such contracts and ignore the irregularities, or, under what is known as the doctrine of estoppel, it may be prevented by the courts from setting up its own illegal acts for the purpose of freeing itself from its just obligations. The contracts of a municipality are enforceable in court like other contracts and neither the city nor the State legislature may by ordinance or statute impair their obligation.

Miscellaneous Powers.—The American municipality enjoys several powers which do not call for elaborate discussion. It may appropriate and spend money for purposes within its authority and in accordance with the procedure outlined in its charter. It may, within these same limits, acquire, manage and dispose of property. It may construct public improvements and in so doing may use the power of eminent domain and levy special assessments. Its power to incur debts, own and operate public utilities and services and grant franchises are treated in separate articles. See Municipal Debts; Franchises; Public Utilities; Assessments.

Liability of Municipalities.—Since a municipality is not a government possessing sovereign powers it is not, like the State, immune from suit without its consent. On the other hand, since in the performance of many functions it is an agent of the State its legal liability is not as wide as that of a private corporation. The rules governing the civil liability of the city are, accordingly, complex. In the first place, its liability upon all contracts which it has legally made is absolute and may be enforced in the usual ways. Secondly, the city is not liable in damages for the torts or legal wrongs resulting from the performance of its *governmental* powers and functions. This immunity rests partly on the theory that the city performs these functions as an agent of the State which is immune from suit, and partly on the theory that it is contrary to public policy to expose the revenues of the city to the heavy drain which an unrestricted liability would entail. This immunity extends to the injuries resulting from the negligence or misconduct of the city's officers and agents, or from the faulty construction, repair or maintenance of its property when used for governmental purposes. By governmental functions or powers are meant those pertaining to the protection of public peace, health, safety, education, charity, etc., in contrast to the commercial or quasi-private enterprises on which modern cities may embark. The municipality is never liable, furthermore, for the tortious acts of its officers when they have exceeded their legal authority. In such a case the injured person may sue the officer individually and recover damages. The State legislature may create by statute municipal liability which would not otherwise exist. In the third place, the municipality is liable in tort for the injuries resulting from the performance of non-governmental or commercial functions, i.e., the operation of revenue-earning utilities, as well as from the use of property not used for governmental purposes. Furthermore, a legal obligation rests on the city to exercise reasonable care in keeping its streets, highways, bridges, viaducts, etc., safe for ordinary use and it is accordingly liable for the injuries resulting from a breach or neglect of this duty. On the whole the modern tendency seems to be to broaden rather than to curtail the civil liability of the municipality.

Consult Cooley, 'Handbook of the Law of Municipal Corporations' (1914); Dillon, 'Municipal Corporations' (5th ed., 1911); Fairlie, 'Municipal Administration' (1910); Goodnow, 'Municipal Problems' (1897); Munro, 'The Government of American Cities' (Revised 1916); Munro, 'The Government of European Cities' (1909).

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MUNJISTIN (purpuroxanthin carboxylic acid), an orange-coloring matter closely allied to purpurin and to alizarin, which occurs in munjeet (East Indian madder), and has the formula $C_{14}H_5(OH)_2O_2.COOH$. It may be changed into purpuroxanthin by boiling with alkalis; also by heating it above 448° F., its melting point. It dissolves in boiling alcohol, separating again, upon cooling, in the form of brilliant golden flakes. Munjistin gives an orange-yellow color when used as a dye with aluminum mordants, which, however, is not fast either as to light or soap. With iron mordants it gives a brownish purple, which is fairly permanent. Munjistin is one of the components of commercial «purpurine,» also known as «Kopp's purpurine.»

MUNKACS, mŭn'käch, Czecho-Slovakia, town in the county of Bereg, located on the Latorcza River and on the Bátyu-Munkács-Lavoczne-Stryj state railway. Its industries consist of vineyards, coarse cloth making, spirit distilleries, petroleum refining, lumber, cattle and grain trade. In the vicinity the noted «Hungarian diamonds» (rock crystal) are mined. Close by are productive alum and iron mines. Built on a high rock in the plain is the historic fortress, usually utilized as a state prison, that was first built in 1359. It was surrendered (1688) to the Austrians after withstanding a siege of three years under the brave leadership of Helen Zriny, wife of the patriot Emmerich Thökölys. Franz Rákóczi II (1703) was defeated here by the Austrians under Nigrelli and the place was surrendered (1708) to the latter. Alexander Ypsilanti was imprisoned here from 1821–23, and the famous painter Munkacsy was born here. Pop. about 17,240.

MUNKÁCSY, moon'kächē, **Michael,** Hungarian painter: b. Munkács, Bereg County, Hungary, 10 Oct. 1846; d. Endenich, near Bonn, 1 May 1900. His real name was Lieb, but he is known only under the assumed name derived from that of his birthplace. Beginning life as a carpenter, he met the strolling portrait painter, Szamossy, in Gyula, who was so much struck by the artisan's interest in art that he gave him painting lessons. Munkácsy proceeded to paint portraits and genre pictures, taking his subjects from common country life. One of these early canvases, ‘A Country Idyll,’ was purchased by the Art Union of Pesth. He eventually put himself under the instruction of the battle-painter, Franz Adam, at Munich. He made rapid progress and the Hungarian government awarded him the first prize for genre paintings thrice in succession and he was thus enabled to take up his residence at Düsseldorf and to study under Knaus and Vautier. The first great picture he painted was ‘The Last Day of a Condemned Man,’ (in the collection of Mrs. W. P. Wilstach, Philadelphia) exhibited in the Paris Salon in 1870. This was followed in 1871 by ‘Wartime’ (an episode in the Hungarian war. The succeeding year he made Paris his home and his pictures began to attract growing attention. He painted many small genres of singular power and character, such as ‘Going to School’; ‘The Kitchen Politician’; ‘The Butter Woman’; ‘The Pawn Shop’ (1874) (Metropolitan Museum, New York); ‘The Workshop’ (1875); but as his strength and mastery of his art grew he rose to loftier subjects, religious and historical. In 1877 he painted ‘Milton in his Blindness Dictating Paradise Lost,’ to which was awarded the gold medal at the Paris Exposition. It is now in the Public Library, New York. Great as was the sensation created by this picture, a historic genre of remarkable coloring in gray and black and of profound insight and power of characterization, an even deeper impression was produced by his ‘Christ Before Pilate’ (1882), which some critics consider the greatest religious picture of its century. This vast canvas is startling in its freshness of conception, its living action, the mingled grandeur and pathos which the artist has infused into his treatment of the central figure, as well as its masterly composition and technique. It has been exhibited in all quarters of the civilized world and was bought by John Wanamaker of Philadelphia for $120,000. It was followed by his dramatic ‘Christ on Calvary,’ the religious intensity of which is heightened by the accurate fidelity to differing national types with which the spectators of the Crucifixion are portrayed; a piece of realism whose suggestiveness is obvious. In 1886, he produced ‘The Last Moments of Mozart,’ now in the collection of Gen. Russell Alger, Detroit, Mich. The present owner paid $50,000 for this pathetic picture, in which the composer is listening to his still uncompleted requiem, sung at his bedside by his favorite singers, the night before his death. The last three years of his life this painter suffered from mental alienation and closed his days in a sanitarium. In addition to the works already mentioned, ‘The Music Room’ and ‘The Two Families’ are in the Metropolitan Museum in New York; ‘The Prowlers of the Night’ is in the Pennsylvania Academy, Philadelphia, and ‘The Story of the Battle’ is in the Walters Gallery, Baltimore. Consult Tait, T. R., ‘Michael Munkácsy’ (in *American Art Review,* Vol. II, Boston 1881).

MUNKAR. See MOHAMMEDANISM.

MUNN, Charles Clark, American novelist: b. Southington, Conn., 1848; d. 8 July 1917. Bred on a farm which he left at 17, for 30 years he was engaged as a commercial traveler. From 1910 he was editor of the *Commercial Travelers' Magazine.* He was the author of several popular novels, including ‘Pecket Island’ (1900); ‘Uncle Terry: a Story of the Maine Coast’ (1900); ‘Rockhaven’ (1902); ‘The Hermit’ (1904); ‘The Girl from Tim's Place’ (1906); ‘Boyhood Days on the Farm’ (1907); ‘Myrtle Baldwin’ (1908); ‘The Castle Builders’ (1910); ‘The Spice of Life’ (1911); ‘The Heart of Uncle Terry’ (1915); ‘Camp Castaway’ (1916).

MUNN, George Frederic, American artist: b. Utica, N. Y., 1852. He began his early studies in art under Charles Calverly, the sculptor and also in the National Academy of Design, New York. Afterward he entered the art schools at South Kensington, England, and there won a gold medal, the first award of the kind to an American. His clay model of the Farnese Hercules won the award. He also was the winner of a silver medal at the Royal Academy for life drawing, and in 1876 entered the studio of George F. Watts. He traveled in Brittany, where he painted and sketched and was a frequent exhibitor at the Dudley Gallery, London, and elsewhere. Among his best-known works are ‘Wild Flowers,’ ‘Roses,’ ‘Meadow Sweet’ and ‘A Sunny Day in Brittany.’ Consult Munn, Margaret Crosby and Cabot, Mary R., ‘The Art of George Frederic Munn,’ with an Introduction by Sir Johnston Forbes-Robertson (New York 1916).

MUNN, Orson Desaix, American publisher: b. Monson, Hampden County, Mass., 11 June 1824; d. New York, 28 Feb. 1907. He was educated at the academy in Monson, was a clerk and country storekeeper there until 1846, and then bought the *Scientific American,* which he made one of the leading scientific papers of the country. Other periodicals owned by him were the *Scientific American Supplement* (1876–) and *Architects' and Builders' Edition* (1885–), now *American Homes and Gardens.* He was also head of Munn and Company, patent solicitors.

MUÑOZ, mu-ñoth, **Juan Bautista,** Spanish historian: b. near Valencia, Spain, 1745; d. Madrid, Spain, 1799. He was graduated from the University of Valencia in philosophy, being influenced more by the views of the enlightenment than by the official scholasticism and was appointed in 1779 historiographer of the Indies and was instructed by the king to write a history of America. This work was published under the title ‹Historia del Nuevo Mundo› in 1793, and though completed only to 1500 is highly valued. Its publication was forbidden by the Council of the Indies, but permitted by Charles IV, notwithstanding its exposition of the barbarity of the Spaniards to the natives. Of his manuscripts many are now in the Academy of History at Madrid, but unfortunately many others are scattered.

MUNRO, mŭn-rō, **Neil,** Scottish novelist: b. Inverary, Scotland, 3 June 1864. He has published ‹The Lost Pibroch: Celtic Tales and Sketches› (1896); ‹John Splendid,› a Highland romance (1898); ‹Gilian the Dreamer› (1899); ‹Doom Castle› (1901); ‹The Shoes of Fortune› (1901); ‹Children of the Tempest› (1903); ‹The Clyde› (1907); ‹Fancy Farm› (1910); ‹Ayrshire Idylls› (1913); ‹The New Road› (1914).

MUNRO, Robert, Scottish archæologist: b. Ross-shire, 21 July 1835; d. 18 July 1920. He was educated at the University of Edinburgh and was a physician at Kilmarnock till 1886 when he turned his attention to archæological researches. He was a member of many learned societies at home and abroad, and published ‹Ancient Scottish Lake Dwellings› (1882); ‹The Lake Dwellings of Europe› (1890); ‹Rambles and Studies in Bosnia, Herzegovina and Dalmatia› (1895); ‹Prehistoric Problems› (1897); ‹Prehistoric Scotland and its Place in European Civilization› (1899); ‹Man as Artist and Sportsman in the Palæolithic Period› (1904); ‹Archæology and False Antiquities› (1905); ‹Palæolithic Man and Terremare› (Munro Lectures, 1912); ‹Prehistoric Britain› (1914); and with others, ‹The Glastonbury Lake Village.›

MUNRO, Wilfred Harold, American historian: b. Bristol, R. I., 20 Aug. 1849. He was graduated (1870) at Brown University, receiving (1873) the A.M. degree. He served (1870–71) as master at De Veaux College, Niagara Falls, as associate principal of Saint Mark's School, Salt Lake City (1871), and spent 1873 in South and Central America. From 1875–79 he was principal at Le Roy (N.Y.) Academic Institute and was president of De Veaux College from 1881–89. He studied at the universities of Freiburg and Heidelberg (1890–91), when (1891–99) he became associate professor of history and director of university extension at Brown University, to be made professor of European history (1899–1911), then emeritus professor. He has written ‹The Story of Mount Hope Lands, a History of Bristol, R. I.› (1880); ‹The Most Successful American Privateer› (1913); ‹Legends of Mount Hope› (1915); ‹Tales of an Old Seaport› (1917). He was editor of the ‹Works of W. H. Prescott› (22 vols., 1905–06), and of the ‹Record Book of the Rhode Island Society of Mayflower Descendants› (1911).

MUNRO, William Bennett, American political economist: b. Almonte, Ontario, Canada, 5 Jan. 1875. He was graduated (1895) at Queen's University, Canada, receiving the degrees M. A. (1896) there, LL.D. at Edinburgh (1898), Ph.D. at Harvard (1900). He studied (1900–01) at the University of Berlin and was (1901–04) instructor of history and political science at Williams College, then, successively, instructor in government (1904–06), assistant professor (1906) and since has served as professor of municipal government at Harvard University. He has been president of the Harvard Co-operative Society, university editor of *Harvard Graduates' Magazine,* and director of the Cambridge Trust Company. He has written ‹Canada and British North America› (1904); ‹The Seigniorial System in Canada› (1907); ‹Documents Relating to the Seigniorial Tenure› (1907); ‹The Government of European Cities› (1909); ‹Initiative, Referendum and Recall› (1911); ‹Government of American Cities› (1912); ‹Bibliography of Municipal Government› (1914); ‹Principles and Methods of Municipal Administration› (1916).

MUNROE, mŭn'rō', **Charles Edward,** American chemist and expert on explosives: b. Cambridge, Mass., 24 May 1849. He was graduated at Harvard (1871); was assistant in chemistry there for three years; professor of chemistry United States Naval Academy (1874–86); chemist to United States Naval Torpedo Station (1886–92); professor of chemistry and dean of faculty of graduate studies of George Washington (formerly Columbian) University, Washington, D. C., 1893–1918; emeritus afterward. He was expert special agent on chemical industries for the United States Census of 1900, 1905 and 1910; consulting explosives expert United States Bureau of Mines since 1907; president of the American Chemical Society (1898); president Cosmos Club (1913 and 1914); received the decoration of the Order of the Medjidje from the Sultan of Turkey (1901); has invented a smokeless powder; and is the author of various monographs on chemistry, notably of explosives.

MUNROE, Henry Smith, American mining engineer: b. Brooklyn, N. Y., 25 March 1850. He was graduated (1869) at Columbia and received (1877) the degree Ph.D. He was (1870–71) assistant geologist of the Ohio State Geological Survey; assistant chemist, United States Department of Agriculture (1870–72); assistant geologist and mining engineer of the Geological Survey of Yesso, Japan (1872–75). In 1875–76 he was professor of mining and geology at the University of Tokio; then successively adjunct professor of surveying and practical mining (1877–91); professor of mining (1891–1915), and emeritus professor in 1915 at Columbia University. He was also dean of the faculty of applied sciences (1897–99) and member of the university council (1895–1915). He was manager (1881–84), then vice-president (1890–92) of the American Institute of Mining Engineers, and was (1908–09) president of the Mining and Metallurgical Society of America and (1909) president of the Society for the Promotion of Engineering Education.

MUNROE, Kirk, American writer of juvenile stories: b. Prairie du Chien, Wis., 15 Sept. 1850. He was educated at the public schools, then studied at Cambridge, Mass., and Harvard. He became the first editor of *Harper's Round Table* (1879–82) and is editor of *Eminent Men of Our Time.* Of the large number of juvenile works from his pen might be selected: 'The Flamingo Feather'; Derrick Sterling'; 'The Golden Days of '49'; 'Dorymates'; 'With Crockett and Bowie'; 'Cab and Caboose'; 'Big Cypress'; 'The Fur Seal's Tooth'; 'Campmates'; 'Canoemates'; 'Raftmates'; 'At War with Pontiac'; 'Under the Great Bear'; 'Forward March'; 'The Belt of Seven Totems'; 'The Outcast Warrior'; 'The Mikado.'

MUNSEE INDIANS, an American tribe of the Delaware family, originally one of the three great divisions of that race. They were sometimes called the Wolf tribe of the Delawares. They resided along the Delaware River, and in New York, Pennsylvania and New Jersey. During the Revolution many of the Munsees removed to Canada, where at Thames, Ontario, there are some survivors. At Green Bay, Wis., is another tribal remnant and a third remnant is found in Kansas; in all, less than 100 in the United States. See DELAWARE INDIANS.

MUNSELL, Joel, American printer: b. Northfield, Mass., 14 April 1808; d. Albany, N. Y., 15 Jan. 1880. He established himself in Albany in 1827, and was publisher and editor of the *New York State Mechanic* from 1841 to 1843. At various times he was the publisher of the *Unionist,* the Albany *Daily State Register, Morning Express* and *Statesman,* and other journals. Munsell made a close study of the art of printing, in its history and application, and his collection of works on the subject, the largest in America, was in part purchased by the State for the New York State Library. He contributed papers to the 'Transactions' of the Albany Institute, of which he was a founder, and published 'Outlines of the History of Printing' (1839); 'Annals of Albany' (1849–59); 'Every-Day Book of History and Chronology' (1856); 'Chronology of Paper and Paper-Making' (1857; enlarged 1870); and 'Manual of the First Lutheran Church of Albany, 1670–1870' (1871)

MUNSEY, mun-si, **Frank Andrew,** American publisher: b. Mercer, Me., 21 Aug. 1854. After receiving a common school education he became manager of a telegraph office in Augusta, Me. He went to New York in 1882 to become editor and publisher of *The Golden Argosy,* a juvenile weekly, which he afterward changed into a monthly for adults under the style of *The Argosy. Munsey's Weekly* appeared in 1889 and after issuing this for one year he transformed it also into a monthly, calling it *Munsey's Magazine.* He now owns *The Argosy, The Railroad Man's Magazine,* and the *All-Story Weekly* and the daily newspapers *New York Sun* and *Baltimore News.* He was a pioneer in the publication of cheap illustrated magazines, *Munsey's* being the first magazine to be sold at ten cents a copy. He is a member of many clubs in New York City and elsewhere and is the author of several books: 'Afloat in a Great City' (1887); 'The Boy Broker' (1888); 'A Tragedy of Errors' (1889); 'Under Fire' (1890); and 'Derringforth' (1894).

MUNSON, James Eugene, American inventor: b. Paris, N. Y., 12 May 1825; d. 1906. He was educated at Amherst College and in 1857 removed to New York, where he was court stenographer for 30 years. He invented the «Munson System» of shorthand, a machine for operating the typewriter by telegraph and a type-setting machine. He published 'The Complete Phonographer' (1866); 'Dictionary of Practical Phonography' (1874; 2d ed. 1906); 'The Phrase-Book of Practical Phonography' (1889); 'A Shorter Course in Munson Phonography' (1901; 2d ed. 1912); 'Phonographic Dictation Book' (1904), etc.

MUNSON, Thomas Volney, American horticulturist and plant breeder: b. on a farm near Astoria, Ill., 26 Sept. 1843; d. Denison, Tex., 21 Jan. 1913. His early education was obtained in the rural district schools, followed by a course in an academy at Lewiston. He subsequently took a course in a commercial college after which he entered the University of Kentucky, whence he was graduated in 1870. Shortly after completing his education he married and removed to the vicinity of Lincoln, Neb. In 1873 he became interested in the improvement of the various species of the native American grapes and planned to do systematic work in the way of developing new varieties by cross-pollenation and hybridization. The experiments thus undertaken were doomed to failure because of climatic rigors and a visitation of the Rocky Mountain locusts. Undismayed, he sought a new location, settling at Denison, Tex., in 1876. There climatic conditions were much more favorable to the prosecution of such experiments and, moreover, wild grapes were much more abundant and more profuse in variety than in Nebraska. He engaged in the nursery business and in the breeding new varieties of grapes and also growing them upon a commercial scale. During the ensuing 25-year period, he produced and experimentally fruited no less than 150,000 new varieties of grapes, many of which were far superior to those hitherto in common cultivation. Only the very best of these were selected for propagation and dissemination and so rigid and exacting was the process of elimination that but 50 varieties were retained for introduction and cultivation as a permanent addition to American viticulture. He became recognized as a botanist as well as a viticulturist, a volume entitled 'Native Trees of the Southwest' having been prepared under the direction of the United States Department of Agriculture and a similar thesis being submitted in 1883 for the master's degree at the Kentucky Agricultural College. But his specialty was the grape and he became the recognized authority on the native wild grapes of North America. His horticultural and scientific work in hybridizing and perfecting the American grapes won recognition abroad as well as at home. In appreciation of his service in producing and introducing resistant stocks with which to restore the phylloxera infested vineyards of France, the French government conferred upon him the diploma and decoration of the Legion of Honor, with the title of «Chevalier du Merit Agricole,» in 1888. He wrote 'Classification and Generic Synopsis of the Wild Grapes of North America' (issued as Bulletin No. 3 of the Division of Pomology, United States Department of Agriculture, Washington, 1890). The most complete botanical display of the whole grape genus ever made was prepared by Mr. Munson and exhibited at the World's Columbian Exhibition at Chicago in 1893 and has since been preserved by the United States Department of Agriculture at Washington. He was the founder and for many years the president of the Texas Horticultural Society and was a member of a number of learned societies, including the American Horticultural Society, the National Agricultural Association of France, the American Pomological Society, the American Breeders' Association and the American Association for the Advancement of Science. His volume 'Foundations of American Grape Culture' (1909), embodied the practical results of more than 30 years of patient, painstaking investigation, experimentation and observation and must long remain the leading treatise of its class. His work, which may be justly said to have been monumental in its significance and beneficence, was continued until his death.

MUNSTER, Ireland, the southwest and largest of the four provinces of that country, bounded on the north by Connaught, on the east by Leinster, and on the west and south by the Atlantic Ocean. It has an area of 9,532 square miles and is divided into the counties of Clare, Cork, Kerry, Limerick, Tipperary and Waterford. Pop. 1,035,495, 94 per cent Roman Catholics.

MÜNSTER, mün'stĕr, Prussia, the capital of Westphalia, a city and episcopal see, in a plain on the Aa, at the junction of several railways and on the Dortmund-Ems canal, 78 miles northeast of Cologne. The site of its mediæval ramparts has been converted into promenades. The principal edifices are the 13th century cathedral, the church of Saint Lambert, the Rathaus, exchange, museum, theatre, the Pauline Library, several educational, benevolent and charitable institutions, etc. The manufactures include woolen, linen and cotton goods, leather, sugar, starch, beer, etc. Münster originated in a monastery around which a settlement arose in the 12th century; it was long governed by martial bishops. The most notable event in its long history occurred in 1532–35 when the city fell into the hands of the Anabaptists (q.v.). Pop. about 90,000.

MÜNSTERBERG, mün'ster-bĕrg, **Hugo,** German-American psychologist: b. Dantzic, Germany, 1 June 1863; d. Cambridge, Mass., 16 Dec. 1916. He was graduated at the Dantzic Gymnasium in 1882, and pursued post-graduate studies in physiology, philosophy, natural sciences and medicine until 1887. He received the degree of Ph. D. at Leipzig in 1885 and that of M.D. at Heidelberg in 1887. After this he was instructor and assistant professor of psychology in the University of Freiburg at Baden, Germany. In 1892 he came to America at the invitation of Harvard University, Cambridge, Mass. He was professor of experimental psychology and director of the Psychological Laboratory in Harvard from that time until his death. His scholarly work was partly psychological, partly philosophical. After 1900 he gave special attention to the new field of applied psychology, in particular to the application of psychology to education, medicine, law, commerce and industry. He was a member of the Psychological Association (president 1898), of the Philosophical Association (president 1908), the Washington Academy, of the American Academy of Arts and Sciences, etc. He was organizer and vice-president of the International Congress of Arts and Sciences at the Saint Louis World's Fair 1904, vice-president of the International Psychological Congress in Paris 1900, vice-president of the International Philosophical Congress at Heidelberg 1907, etc. In 1910–11 he was Harvard exchange professor at the University of Berlin and during that year founded the Amerika-Institut in Berlin. During the whole period of his American stay he worked for the improvement of the relations between the United States and Germany, writing in America for a better understanding of Germany and in Germany for a higher appreciation of America. The outspoken views of Professor Münsterberg on the issue of the War of 1914 raised storms of controversy about his head. He appeared as probably the most eminent supporter of German policies in America, and as such was most bitterly condemned by the Entente Allies and their friends, while to the pro-Germans he appeared almost an idol. While supporting German policies, Professor Münsterberg denounced many of the activities of the Teutonic hyphenates in this country. He condemned the forming of an alien party within the United States as «a crime against the spirit of true Americanism,» and said that its results would reach far beyond the time of the war. Professor Münsterberg's early writings in Germany were exclusively devoted to experimental psychology. During his sojourn in America he published the following works, some of which have been translated into many languages: 'Psychology and Life' (1899); 'Grundzüge der Psychologie' (1900); 'American Traits' (1902); 'Die Amerikaner' (1904; revised 1912); 'Principles of Art Education' (1905); 'The Eternal Life' (1905); 'Science and Idealism' (1906); 'Philosophie der Werte' (1907); 'On the Witness Stand' (1908); 'Aus Deutsch-Amerika' (1909); 'The Eternal Values' (1909); 'Psychotherapy' (1909); 'Psychology and the Teacher' (1910); 'American Problems' (1910); 'Psychologie und Wirtschaftsleben' (1912); 'Vocation and Learning' (1912); 'Psychology and Industrial Efficiency' (1913); 'American Patriotism' (1913); 'Grundzüge der Psychotechnik' (1914); 'Psychology and Social Sanity' (1914); 'Psychology, General and Applied' (1914); 'The War and America' (1914); 'The Peace and America' (1915); 'The Photoplay, A Psychological Study' (1916). He was also a large contributor of psychological and philosophical articles in the scientific magazines and of social, political and practical psychological articles in the popular periodicals.

MUNTJAC, a small East Indian deer representing the genus *Cervulus,* which resembles the musk-deer in many points, especially in having, in the male, long sharp upper canine teeth, or tusks, which are effective weapons. These little deer, only 20 to 22 inches in height inhabit hilly jungles, and have lyrate, single-pronged antlers, mounted upon remarkably tall pedicels. The females have no antlers. Several species are known, of which the most familiar is the Kakar or barking-deer (*C. muntjac*) of Indian sportsmen, whose loud resonant cries may be heard at a surprising distance, and which is a favorite not only because it exercises skill in its pursuit, but gives excellent venison. Allied species are found in China and the Malay archipelago, and fossil related genera existed in Europe in Tertiary times. Consult Kinloch, ‹Large Game Shooting› (1885).

MÜNTZ, münts, **Eugène**, French art critic: b. Sulz, Alsace, 1845; d. Paris, 30 Oct. 1902. He studied at the Lycée Bonaparte, Paris, and then went (1873–76) to the French School at Rome, when he was appointed librarian at the École des Beaux Arts, Paris, to become (1880) curator of the library, archives and of the Museum. He made a number of trips to Germany, England and Italy for research. Among the most important of his many works are ‹Les arts à la cour des Papes pendant le XV et le XVI siècle› (1878–98, 4 vols., awarded prize of the Academy of Fine Arts); ‹Raphaël, sa vie, son œuvre et son temps› (1881, 3d ed., 1899), also a short biography of Raphaël (1901); ‹La tapisserie› (1882; 5th ed., 1903); ‹La Renaissance en Italie et en France à l'époque de Charles VIII› (1885); ‹Tapisserie, broderies et dentelles› (1890); ‹La mosaïque chrétienne pendant les premières siècles› (1893); ‹Florence et la Toscane› (1897; new ed. 1901); ‹Léonard de Vinci› (1898). Under the title ‹Bibliothèque internationale de l'art› undertaken in collaboration with foreign critics and published since 1881, he brought out a number of monographs which he called ‹Les précurseurs de la Renaissance,› which were followed by ‹Les collections des Medicis› (1887) and later ‹Les historiens et les critiques de Raphaël› (1884) and ‹Études sur l'histoiré de la peinture et de l'iconographie› (2d ed. 1885). He also collaborated with Guiffrey in ‹Histoire générale de la tapisserie.› He was made a member of the Institut de France. Consult Girodie, ‹Eugène Müntz› (Strassburg 1902).

MUNZER, münt'sĕr, **Thomas**, German religious fanatic: b. Stolberg, about 1490; d. Frankenhausen, 15 May 1525. He claimed that he was in direct communion with the Holy Spirit, and advocated communism, denouncing all existing governments. His violence brought him into conflict with Luther as well as with the Catholics. He preached at Zwickau in 1520, and at Prague in 1521, promulgated his doctrines at Allstedt in Thuringia in 1523, and excited the people to revolt against the authorities. In Mühlhausen (1524) he gained the unqualified support of the populace, deposed the city council and appointed a new one, suffered the monasteries and houses of the wealthy to be sacked, and proclaimed a community of goods. He was now joined by another fanatic named Pfeifer, with his troop of rapacious followers, and this circumstance with the news that 40,000 peasants had assembled in Franconia, and plundered and burned 150 castles of the nobles and 23 monasteries, inflamed his zeal, and he joined in what was termed the «Peasants' War,» intending to exterminate «the godless princes and priests.» Leaving Pfeifer governor in Mühlhausen, he proceeded to Frankenhausen, and rekindled the ardor of the townspeople. The dukes of Saxony, Philip and Brunswick, and other rulers sent a force against the insurgents; Münzer was totally defeated after an obstinate struggle, was taken and executed. (See PEASANTS' WAR). Consult Merx, ‹Thomas Münzer und Heinrich Pfeiffer› (Göttingen 1889); Seidemann, ‹Thomas Münzer› (Leipzig 1842); Strobel, G. T., ‹Leben, Schriften und Lehren Thomä Müntzers› (Nürnberg 1795); Wolfram, G., ‹Thomas Münzer in Allstedt› (Jena 1852).

MUNZINGER, moont'sĭng-ĕr, **Werner**, Swiss explorer: b. Olten, Switzerland, 4 April 1832; d. Africa, 14 Nov. 1875. He was educated at Bern, Munich and Paris. He engaged in mercantile life at Alexandria, Egypt, in 1852–53. He participated in several expeditions of exploration into Abyssinia, and later became British and then French consul, and finally governor under the Khedive at Massowah in Egyptian Abyssinia. In 1870 he made an expedition into southern Arabia. In 1872 he became Pasha and governor-general of the eastern Sudan. He was killed in 1875 while leading an expedition against Abyssinia. Among his works are ‹Ostafrikanische Studien› (1864); ‹Vocabulaire de la Langue Tigré (1865).

MURADABAD, moo-rä-dä-bäd', India, city and capital of the district of Muradabad in the United Provinces, on the Ramganga River, situated 50 miles north by west of Bareilly. The city has an extensive commerce in rice, sugar, wheat and other products of the surrounding district and has cotton factories, printing establishments and manufactories of engraved brass ware. Its most notable architectural feature is the great mosque erected in 1631. There are also Saint Paul's Church (Church of England), and the American Methodist Church founded in 1874. Rustam Khan founded Muradabad in 1625; the ruins of his early fortifications are still visible. The city is governed by a council of 23 members, of whom five are appointive and the remainder elected. A cantonment is located on the outskirts of the city to the northwest. Pop. 81,168.

MURÆNA, a very large marine eel or moray of the family *Murænidæ*. (See MORAYS). There can be little doubt that the *muræna* of the Roman feasts often translated «lamprey,» was one of the true eels. It was held in the highest esteem. Pliny tells of the enormous sums of money and the great care which were spent on the cultivation of the muræna. The artificial fish-pond of Lucullus was said to have been sold for about $200,000; and one Hirrius is said to have furnished Cæsar with 6,000 murænas alone for a regal entertainment given to the people. These fishes were kept as pets by the Roman nobility. See MULLET.

MURAL CIRCLE, *in astronomy*, an instrument consisting of a circle carrying a telescope and mounted against a wall; whence its name. The telescope revolved in the plane of a meridian. It was formerly employed in observatories to measure the zenith distances of stars, and thus their declination. The mural circle is now superseded by the *Meridian Circle.*

MURAL PAINTING, that branch of interior decoration which has for its object the adornment of the walls of buildings by painting, as distinguished from mosaic, wainscoting, sculpture, tapestry and all other kinds and means of adornment. By extension the term includes also the painting of vaults and ceilings. It is not commonly used of mere painting with uniform flat color, but only of such painting as involves systematic decorative design, whether pictorial or by means of conventional patterns and ornament. In its highest development it is the most exalted, spiritual and imaginative form of decorative art, and indeed of painting in general, and has enlisted the genius of the most gifted painters of all time.

General Purpose and Principles.— Mural painting is not an independent art, like the painting of easel pictures, but an art intimately allied with architecture. Its function being that of enhancing the beauty of the structure to which it is applied, the decorator must subordinate his invention to the architectural conditions and character of the building and of the spaces he is to adorn. He must consider the size, scale and proportions of the room; its architectural style, features and divisions; its conditions as to lighting; the distance from the spectator's eye of the various surfaces he is to paint; and thus to make his paintings contribute to the dignity and effectiveness of the completed structure. This requires a knowledge of architecture and a sympathetic attitude toward the architect's purpose, and the best results are secured when the architect and painter have collaborated from the beginning. Usually, however, the building is «turned over» to the decorator only when completed, and the artist must do his best with the conditions thus created for him in advance. He is least hampered when the interior surfaces assigned him (for nearly all mural painting is of interiors) are broad and simple, as in the Arena Chapel at Padua by Giotto and the Sistine Chapel at Rome by Michelangelo and others; but the truly great artist can triumph over such architectural complexities as the great ceilings in the Ducal Palace at Venice and the richly paneled vault of the Camera della Signatura at Rome.

In general, the mural painter has to deal with two distinct elements of design: the pictures which form the chief part of most decorative schemes, and the framework, borders and other adjuncts of conventional ornament by which they are both related to and separated from the architectural members and features of the structure. There are many subordinate spaces too small for pictures, which may be enriched with arabesques and patterning in color and thus harmonized with the greater decorations. There are, indeed, many interiors which offer little opportunity for pictorial decoration but abundant scope for painted ornament, as in many French Renaissance buildings of the 16th–18th centuries. Such decoration requires a thorough mastery of ornament in the various historic styles and calls for decorative fancy rather than for the higher forms of artistic inspiration.

The subjects treated by the mural painter may be broadly divided into the historical, the allegorical and the fanciful, varying according to the purpose of the building or room to be decorated. In the first class may be included not only actual historical events, but scenes from legendary lore and such Scriptural scenes as are narrated in the Bible as actually occurring, without regard to questions of scientific historicity. In the second class we may include all allegorical and symbolic representations and such Scriptural subjects as are prophetic, apocalyptic or abstract. Subjects of the third class belong to the lighter phases of the art as applied to houses, ball-rooms, theatres, etc., and may include fanciful landscapes, pastorals, genre subjects and the like. The highest reach of the art is attained when a great master handles such tremendous «allegories» as 'Paradise,' the 'Last Judgment,' 'The Redemption,' 'The Triumph of Christianity,' as in the frescoes by Michelangelo in the Sistine Chapel, or the extraordinary paintings by Sargent in the Boston Public Library. Even maps have been used as mural painting, e.g., those covering the walls of the famous Gallery of Maps in the Vatican (1581), and those painted on the upper part of the walls of the great waiting-room of the Pennsylvania Terminal in New York.

Whatever the subject and whatever the surface on which it is painted, it may be handled in either of two ways: either so as to recognize the hard and impenetrable wall or vault which it adorns, or so as to ignore it and, as it were, make the spectator forget its existence or at least its impenetrability. In the first kind, the colors are more or less flat, the figures are formally disposed and appear to be as nearly as possible in one plane, and there is little effect of light-and-shade (*chiaroscuro*) or perspective. Such are the engraved paintings on Egyptian temple-walls and columns, nearly all mediæval paintings and, in a measure, some of those of the modern Puvis de Chavannes (q.v.). One feels that these are paintings on a wall. To the second class belong many Pompeiian paintings and nearly all those of Renaissance and modern times, in which perspective, both geometric and aerial, and all the resources of realistic representation, of distance and the third dimension, combine to create an illusion of actuality and space; to «break through the wall» as the painters say. But even in such paintings a certain formality of composition and an evident recognition of the shape of the space occupied may serve to distinguish them as real mural decorations rather than easel pictures framed and hoisted into their places on wall or ceiling.

Methods and Technic.— Four processes or methods of producing mural paintings have predominated in the history of the art: Fresco, Tempera (or painting in distemper), Encaustic and Oil painting.

Fresco was the process most generally employed in the Early Renaissance, in the Middle Ages and to some extent in antiquity. In fresco painting the pigment, mixed with water, is applied to a specially prepared surface of wet plaster, which it penetrates so that when the plaster sets the picture is incorporated in its substance and to some extent encased in a thin coating of carbonate of lime. Only so much of the picture can be painted at a time as will cover the plaster before it hardens, after which the unpainted remainder of the plaster must be cut away. Thus each day's work must be complete in itself, there can be no retouching or correction on that portion except in distemper, which is less permanent. «Buon fresco» is pure fresco, untouched with tempera, and such are the greatest works of the later masters in fresco. The mediæval and early Renaissance painters (and probably also the Greco-Romans) used tempera retouching quite freely. But even with tempera retouching fresco-painting is a difficult process; and the work must be done in place, not in the studio, and to paint a damp ceiling while lying on one's back is no easy task. Oil painting has almost completely driven out this most permanent and monumental style of painting, in which most of the greatest works of the Italian Renaissance were executed. See PAINTING.

Tempera, or painting in distemper, is a process of painting on dry plaster with pigments carried by some slightly glutinous medium, like white of egg or honey, or gum, mixed with water. The work must be done in place, like fresco, but is easier of execution and permits of retouching and correction *ad libitum.* It is far less permanent than fresco, being likely to scale, peel or powder off. It was, however, much used in antiquity, and the so-called «frescoing» or painted decoration on walls and ceilings of ordinary modern houses and apartments is done in distemper.

Encaustic is painting on a surface prepared with wax, and employs either distemper pigments which after painting are covered with a coat of melted wax, or pigments mixed with melted wax on a hot palette. It is a difficult and meticulous process, which was used by the Romans for certain details of their mural a coat of melted wax, or pigments mixed with occasionally by modern artists, F. C. Crowninshield among them, but has no decided advantage over oils sufficient to counterbalance its difficulties.

Oil painting, which employs linseed oil as the carrying medium of the pigment and turpentine as a dryer, appears to have been first developed in Flanders in the 15th century and thence to have been carried to Italy, where it finally supplanted all other processes, first for easel pictures and altar-pieces, and later, in the hands of the great Venetian painters, for mural decorations of the greatest magnificence. Oil painting has many advantages; it can be executed in the studio, upon wood, copper or canvas, the latter being usually employed; it is the most brilliant of all kinds of painting and lends itself to the greatest variety of technic, and can be indefinitely corrected and retouched. For these reasons it is the preferred process of nearly all modern muralists. Its disadvantages are that it cannot be executed directly on plaster, even specially prepared for it, with any prospect of permanence; and execution in the studio often leads to disappointing results when the work is in place; moreover it is liable to darken with age and to suffer from deterioration of the canvas. Yet many of the great Venetian masterpieces are as brilliant to-day — or nearly so — as when painted over 300 years ago. Sometimes the painted canvas, instead of being mounted on a stretcher, is «glued» to the wall by the use of thick white lead and oil. This method is called «marouflage» by the French. It can only be used upon walls absolutely protected from dampness.

Two other processes deserve mention, having been used with some success in Germany and England respectively: *water-glass* and *spirit fresco.* The first requires special preparation of the wall-plastering, which is then primed with a thin coat of lime mixed with a special preparation made in Germany, and when dry is successively treated with ferro-silicic acid and two coats of water-glass (potassium silicate). The colors, specially made for this process, are laid on with water, and the finished painting when dry is sprayed with a fixative. It is said to be ill adapted to very damp climates, but has been successfully used, even for out-door wall-paintings, in Paris as well as in Germany. The «spirit fresco» process invented by Gambier Parry and employed by him in the House of Parliament, makes use of wax and certain gums, melted and dissolved in turpentine, as a medium both for sizing the plaster and for carrying the pigment. The wall, thus sized, is primed with white lead and gilder's whitening, and when dry can be painted upon with colors mixed with the medium, as if with oils. The painting can thus be corrected and touched up without danger, and the result appears to be satisfactory as to permanence.

Exterior Mural Painting.— The Egyptians, Greeks and Pompeiians, all executed painted decorations on walls exposed to the weather. In dry climates like those of Egypt, Greece and southern Italy, tempera painting upon carefully prepared stucco is fairly durable. Modern efforts to produce such durable out-of-doors paintings on plastered walls have rarely been successful. Hittorff's decorative paintings on the façade of Saint Vincent de Paule in Paris (1846), quickly faded and peeled, although sheltered by a portico. Kaulbach's great exterior «frescoes» on the New Pinacothek at Munich have fared better; they were presumably executed in water-glass. The danger to such paintings lies not merely in alternations of dry and damp, heat and frost, but also in the acid fumes from factories, coal-smoke and gas-works in modern cities, so that ceramic tiles and mosaic are now generally preferred as the means for color and pictorial effects on the exteriors of buildings. The Germans, it is true, frequently paint ornamental designs on their stuccoed façades, but these decorations have to be periodically renewed. No really successful process has ever been devised for painting directly on stone or marble, exposed to the weather. The ancients always covered even marble surfaces with a thin coating of very fine lime stucco, sometimes called «mastic,» before applying their polychromatic decorations.

Historical Summary.— The articles INTERIOR DECORATION and PAINTING summarize briefly from different points of view the general history of which that of mural painting is a part. From these the reader may gather some idea of its progress from the prehistoric cave paintings through the Egyptian and Greek civilizations, the brilliant and fantastic Pompeiian and Roman developments, and the solemn religious representations of the early Christian and Byzantine churches, to its partial eclipse, outside of Italy, in the Gothic period. It was largely displaced in Byzantine art by the more brilliant art of mosaic, and in the Gothic period by that of stained glass, although the painting of conventional patterns on walls, columns and vaults never entirely ceased. It was in Italy, pre-eminently the land of color-decoration, that mural painting was revived in the 13th century by Cimabue, and carried to a marvelous perfection in the 14th century by Giotto and his followers, in the church of Saint Francis at Assisi, the Arena Chapel at Padua and the churches of Santa Croce and Santa Maria Novella at Florence. Another school was early developed in Sienna, and the Tuscan artists were widely employed even in distant cities. In these works, which were anticipatory of the Renaissance, an effort after realism took the place of the Byzantine character of conventional formality of the earlier artists. With the 15th century other «schools» (i.e., styles of painting led by one or more great artists and their followers) developed in northren Italy, in Umbria, Rome and later in Venice. The human body was studied; artists painted from models; an increasing mastery of light-and-shade and of perspective made possible a corresponding increase in realism. The earlier pictures symbolized or suggested facts and events; the later ones show the artists' effort to picture a scene as he imagined it would have appeared to an actual spectator. This completely changed the character of all mural painting; the flat wall or ceiling or curved vault was more and more ignored, and the distinction between mural decoration, in its strictest sense, and easel pictures painted merely to fit a given space, was less and less insisted on. Distance, perspective, relief and living action were more and more perfectly represented. But the decorative sense was never lost and the grandeur of the composition, its harmony of line and of color, and the absolute beauty of the result, are in many cases so admirable that one cares not at all to think about the wall or the vault. The highest development of this art in fresco was reached in Rome in the first half of the 16th century, especially in the Vatican. For majesty and solemn significance the paintings in the Sistine Chapel are unapproached; for richness and splendor those of Raphael in the Stanze, especially the Camera della Segnatura, are unsurpassed. For decorations of a lighter sort, Raphael in the Vatican Loggie, and with his pupils in the Farnesina Palace and the Villa Madama and Giulio Romano at Mantua, revived the old Roman practice of combining mural painting with delicate stucco-relief. In Venice the art of painting in oils received its most brilliant development as applied to the decoration of walls and ceilings at the hands of Titian, Paolo Veronese and Tintoretto in the Ducal Palace. Churches throughout Italy were made splendid with frescoed vaults and painted ceilings. The art declined after 1600, but many brilliant works in both mediums were still executed, and Tiepolo (1693–1770) in Venice, Würzburg and Madrid, temporarily revived the art with paintings of a marvelous *bravura* of conception and execution.

In modern times the French have led in mural painting; no considerable public building is erected without providing for interior mural paintings by the greatest artists (Opera House by Baudry; Hôtel de Ville by various artists; Sorbonne and Panthéon by Puvis de Chavannes and others). In England there has also been a notable revival in the last 50 years; men like Gambier Parry, Cope, Dice, Lord Leighton, Sir E. J. Poynter, and of late especially Frank Brangwyn, have executed notable decorations in fresco, spirit fresco and oils in both public and private buildings.

In the United States previous to 1876 there was no mural painting worthy of the name, though in the National Capitol a group of second-rate Italian painters had for years been employed in decorating the dome. In 1876 Mr. John LaFarge was commissioned to decorate the interior of Trinity Church, Boston, and gathered about him a group of young artists to assist him, many of whom later reached distinction. This was the first work of American artists in this field, and for many years thereafter it remained almost alone. But in 1891–93 for the Columbian Exhibition at Chicago a number of artists, now well known, were employed to paint decorative compositions in the various buildings, and a few years later, in the Boston Public Library and the Congressional Library at Washington, more inspiring opportunities were given to artists like E. A. Abbey, J. S. Sargent, E. H. Blashfield, Kenyon Cox, Elihu Vedder, Gari Melchers, W. deL. Dodge, W. H. Low, H. Walker, E. Simmons and others, for permanent and monumentally important works. Since then such opportunities have been multiplied tenfold in State capitols, courthouses, libraries, theatres, hotels and private houses, and the number and the skill of American mural painters have both increased greatly. See articles INTERIOR DECORATION and PAINTING, also those on particular phases or styles of art and on particular artists, e.g., GIOTTO, MICHELANGELO, PERUGINO, RAPHAEL, TIEPOLO, TITIAN, etc.

Bibliography.— The best general accounts of the art of mural painting are by F. Crowninshield, ‹Mural Painting› (Boston 1887), and A. L. Baldry, ‹Modern Mural Decoration› (London 1902). For original documents on historic methods and processes, Mrs. Merrifield, ‹The Arts of Painting› (London 1849). For early mediæval painting, N. H. J. Westlake, ‹History of Design in Mural Painting . . . to the 12th Century› (London 1915). Consult also W. and G. Audsley, ‹La Peinture murale décorative dans le style du moyen-âge› (Paris 1881); J. D. Crace, ‹The Art of Colour Decoration› (London 1912); P. Gélis-Didot, ‹La Peinture décorative en France› (Paris, n.d.); L. Gruner, ‹Fresco Decorations and Stuccoes of the 15th and 16th Centuries in Italy› (London 1854); J. I. Hittorff, ‹Le Temple d'Empédoe . . . ou l'architecture polychrome, etc.› (Paris 1851), and for American work, E. H. Blashfield, ‹Mural Painting in America› (New York 1913), and in S. Isham, ‹The History of American Painting› (chapter XXV, an excellent brief account of mural painting in America). See also the bibliographies under INTERIOR DECORATION and PAINTING.

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MURANO, moo-rä'nō, Italy, town in the province Venice and situated on an island in its lagoons, one and a half miles north of Venice. It contains the very ancient basilica, San Donato Cathedral, which was repaired as early as the 12th century; a 16th century Renaissance church (San Pietro Martire) with its altar painting by Bellini. The town has for centuries been world-renowned for its glass industry (see GLASS), the wonderfully artistic delicate blown-glass ware being highly valued in the collections of connoisseurs. It also has a glass-industries museum. The noted Venetian pearls also are manufactured here. Consult Molmenti, 'Le isole della Laguna Veneta' (Venice 1895).

MURAT, mü-rä, **Joachim**, French marshal and some-time king of Naples: b. Bastide, Lot, France, 25 March 1771; d. Pizzo, Calabria, Italy, 13 Oct. 1815. He was the son of a prosperous innkeeper of La-Bastide-Fortunière, near Cahors, France, and had a remarkable career. While studying for the priesthood at Toulouse he enlisted in a cavalry regiment but was soon dismissed for insubordination. He served in the constitutional guard of Louis XVI; then entered the 12th regiment of mounted chasseurs and rose by his zealous Jacobinism to the rank of lieutenant-colonel. He attached himself to Napoleon in 1795, and followed him to Italy and to Egypt. In these campaigns he frequently distinguished himself, and in 1799 Napoleon appointed him general of division. He clung close to the great leader and returned to France with him from the disastrous Egyptian campaign. At a time when everything depended on prompt action he rendered Napoleon most valuable service by dispersing the Council of Five Hundred at Saint Cloud, on the memorable 18th Brumaire. In gratitude and as a reward Napoleon entrusted him with the command of the Consular Guard, and shortly after (20 Jan. 1800) gave him his youngest sister, Caroline, in marriage.

Murat had command of the cavalry at the battle of Marengo and expelled the Neapolitans from the Papal States. In 1803 he was made a member of the *Corps Legislatif*, and in 1804 was the governor of Paris. On the establishment of the Empire Murat became one of the popular idols, and was showered with honors. He was made marshal of the empire, grand-admiral, and prince of the imperial house. His services in the campaign of 1805 against Austria, in which he entered Vienna at the head of the army, were rewarded in 1806 with the grand-duchy of Cleves and Berg. He participated in the battles of Austerlitz, Jena, Eylau and Friedland. In the war of 1806 with Prussia, and of 1807 with Russia, he commanded the cavalry, and in 1808 he commanded the French army which occupied Madrid, and quelled the insurrection there in May. He expected to receive the crown of Spain, as Charles IV had invested him with royal authority; but Napoleon, who destined Spain for his brother Joseph, placed him on the throne of Naples, 15 July 1808. He then took the title of Joachim I. Ferdinand IV (q.v.), however, continued to rule in Sicily under English protection. Murat proved a beneficent king and instituted some reforms, but he was, after all, but the tool of Napoleon. He shared the hardships and reverses in the disastrous Russian campaign of 1812, and returned to Naples discouraged and discontented. In 1813 he again fought for Napoleon, whose cause he deserted after the battle of Leipzig. He entered into a treaty with England and Austria in 1814 which guaranteed him his throne on condition that he would join the coalition against Napoleon. He pretended to keep this treaty by attacking Eugène Beauharnais in a half-hearted manner. He took up arms again in 1815 for Napoleon; but being defeated by Generals Neipperg and Bianchi he was forced to leave Italy, and took refuge in Toulon. His offers of aid were spurned by Napoleon. After the overthrow of Napoleon he escaped to Corsica, declining the offer of an asylum in Austria which was made to him by Metternich, and set sail for the Neapolitan territory with a view to the recovery of his kingdom. He foolhardily landed at Pizzo on 8 October, but was immediately captured, tried by court-martial, condemned and shot. Murat was vain, unstable and full of ambition. As a cavalry leader his dashing bravery inspired his men with almost superhuman courage. As king, he proved himself sincerely eager to initiate genuine reforms, and did much to abolish banditry. Consult Attridge, A. H., 'Joachim Murat' (New York 1911); Espitalier, A., 'Napoleon and King Murat, 1808–15' (New York 1911); Helfert, 'Joachim Murat, seine letzten Kämpfe und seine Ende' (Vienna 1878); Johnston, C. H. L., 'Famous Cavalry Leaders' (Boston 1908); Johnston, R. M., 'Napoleonic Empire in Southern Italy' (2 vols., New York 1904); Lumbroso, A., 'Correspondance de Joachim Murat' (Milan 1899); Murat, Count, 'Murat, lieutenant de l'empereur en Espagne' (Paris 1897); Romano, G., 'Ricordi muratiani' (Pavia 1890); Sorel, A., 'L'Europe et la révolution française' (8 vols., Paris 1885–92).

MURAT, Napoleon Achille, French American author: b. Paris, 21 Jan. 1801; d. Wasceissa, Leon County, Fla., 15 April 1847. He was the son of Joachim Murat, king of Naples, and before his father's overthrow bore the title of Prince of the Two Sicilies. When his father lost the throne he sought refuge in Austria, where he received his education. In 1821 he came to the United States, and after an extended tour through the country bought a large estate and settled near Tallahassee, Fla., where he devoted himself to farming and literary work; he also gave largely to and was active in philanthropic enterprises. He became a United States citizen, and in 1824 was made alderman of the city of Tallahassee, in 1825 mayor and in 1826 postmaster. He accompanied Lafayette during most of his visit to the United States. He married, in 1826, Mrs. Catherine Gray, a daughter of Byrd C. Willis of Virginia and a grandniece of Washington. He refused many offers of political advancement, and lived quietly on his estate. In 1828 he published in the Paris *Revue Trimestrielle* a series of letters on political parties in the United States, which were later published as 'Lettres d'un Citoyen des Etats Unis à ses Amis d'Europe'; in 1838 he published 'Esquisses morales et politiques sur les Etats Unis d'Amérique'; and 'Exposition des Principes du Gouvernement républicain tel qu'il a été perfectionné en Amérique' (Exposition of the Principles of Republican Government as Perfected in America). This latter work was very popular among those of republican sympathies in Europe, was translated into several different languages and passed through over 50 editions. Consult MacConnell, 'The Prince and Princess Achille Murat in Florida' (*Century Magazine*, New York 1893).

MURAT, Napoléon Lucien Charles, PRINCE OF PONTE CORVO, French politician, second son of Joachim Murat: b. Milan, 16 May 1803; d. Paris, 10 April 1878. He left Italy for Austria with his mother in 1815; started for the United States in 1824 to join his uncle Joseph, but was shipwrecked on the Spanish coast, and held prisoner for a time; arrived in Boston in 1825; and in 1827 married an heiress of Bordentown, N. J., Georgina Fraser, who was soon afterward reduced to school teaching for her living. Murat returned to Paris in 1848, sat in the Constitutional Assembly and in the Legislative Assembly (1849), was Minister to Turin (1849–50), had his debts paid and received a pension of $30,000 a year under Napoleon III, and in 1859–60 made a feeble claim to the crown of Naples, but received no support from France. His vote in the Senate, where he sat from 1852 to 1870, for the temporal power of the Pope, alienated from him the French Freemasons, whose grandmaster he had formerly been. He retired to private life after the revolution of 4 Sept. 1870.

MURATORIAN FRAGMENT, or **CANON OF MURATORI,** a fragment from an ancient Bible treatise discovered in the Ambrosian Library at Milan by Lodovico A. Muratori and published (1740) in his 'Antiquitates italicæ.' It contains an imperfect list of the books in the New Testament, and is considered highly important as testimony of at least a list of some of the works considered canonical at the time of writing, which is supposed to be late in the 2d century. The much-damaged documentary fragment is in barbaric Latin, probably translated from the Greek. The books are named in their order and start with mention of the Gospel of Saint Mark on its first line which is broken and probably contained mention of Matthew as Saint Luke's Gospel is mentioned as third. Saint John, the Acts, 13 epistles of Saint Paul are cited (omitting Epistle to the Hebrews), the Revelation of John, Jude, two epistles of John (James is omitted, also Peter), but the Apocalypse part of John and that of Peter are accepted, as is also Wisdom of Solomon as being written by his friends. A translation is to be found in H. W. Gwatkins, 'Selections from Early Christian Writers' (New York 1893) and Lietzmann's 'Kleine Texte für theologische Vorlesungen, No 1' (Bonn 1902). Consult Kuhn, 'Das muratorische Fragment' (Zürich 1892); Tregelles, 'Canon Muritorianus' (Oxford 1867).

MURAVIEFF, moo-rä-vē-ĕf', Russian noble family, originally settled in the grand-duchy of Moscow, but in 1488 receiving from Ivan Vassilievitch holdings in Novgorod. Its chief members are NIKOLAI JEROFEYEVITCH, d. Montpellier 1770, governor of Livonia and author of the first Russian algebra. MIKHAIL NIKITITCH, b. Smolensk, 25 Oct. 1757; d. Saint Petersburg, 29 July 1807; was chosen tutor to the grand-dukes Alexander and Konstantin in 1785, rector of the University of Moscow (1796), and Secretary of State to the Ministry of Public Instruction (1801); and wrote a manual of ethics, which is classic in Russia (1810, 1815). NIKOLAI NIKOLAIEVITCH, son of the governor of Livonia: b. Riga, 1768; d. Moscow, 1 Sept. 1840; was educated at Strassburg; entered the navy 1788; was captured in 1790; was transferred to the army in 1796; and from 1797 to 1823, with the exception of service against Napoleon in 1812–14, he was at the head of a private military school near Moscow, which was bought by the government in 1816. His son, ALEXANDER NIKOLAIEVITCH, b. 1792; d. Moscow, 1864; was sent to Siberia for his part in the conspiracy of 1825; was pardoned; served in the Crimean War and became major-general; and as governor of Nijni Novgorod did much for the abolition of serfdom. Another son, NIKOLAI NIKOLAIEVITCH, b. Saint Petersburg, 1793; d. there, 4 Nov. 1866; entered the army at 17; served in the Caucasus; was sent to Khiva 1819; distinguished himself in the war with Turkey, 1828–29, and in the Polish campaign, 1831; in 1832 treated with Mehemet Ali; was disgraced and retired in 1838, but reinstated in 1848; and in 1855 commanded the army in the Caucasus, taking Kars. He wrote a valuable book about his travels in Khiva (1822), and on the campaign in the Caucasus in 1855 (1876). His brother, MIKHAIL NIKOLAIEVITCH, b. 1795; d. Syrez, near Luga, 10 Sept. 1866; fought against France (1812–13); took part in Decembrist uprising and was jailed for five months; became major-general in 1830; was military governor of Grodno; was a member of the Council of State, 1850–62; opposed the emancipation of the serfs; used such cruelty in putting down a student rising in 1861 that he was forced to resign; but in 1863 was sent to Wilna as governor-general, and won from the Poles the name of the Hanger or Executioner by his pitiless severity; and in 1866 was president of the commission which examined Karakasoff, who attempted to assassinate Alexander II. His memoirs were published by his grandson, MIKHAIL NIKOLAIEVITCH, b. 7 April 1845; d. 21 June 1900; Ambassador to Berlin (1885), to Copenhagen (1893); and from 1897 to his death Foreign Minister. He did much to solve the Cretan question, published the invitaton to The Hague Peace Conference (1898), and forwarded Russia's interests in China. Another NIKOLAI NIKOLAIEVITCH, COUNT MURAVIEFF AMURSKY, b. Saint Petersburg, 1809; d. Paris, 19 Nov. 1881; fought in the war with Turkey, 1828–29; became governor-general of eastern Siberia in 1847; in 1858 concluded the Treaty of Aigun with China, by which Amur was ceded to Russia, and thus won the title Amursky; and in 1859 arranged a treaty with Japan at Yeddo. The last 20 years of his life were spent in Paris. The Muravieff-Apostol branch of the family, so called because of its intermarriage with that of Apostol, a Cossack hetman, is most prominently represented by IVAN (1769–1851), who translated Aristophanes, Horace, Sheridan, etc., into Russian; and by his son SERGEI (1796–1826), who took part in the conspiracy of 1825 and was executed in Saint Petersburg.

MURCHISON, mėr'kĭ-sŏn, SIR **Roderick Impey,** Scottish geologist: b. Tarradale, Ross, Scotland, 19 Feb. 1792; d. London, 22 Oct. 1871. He was educated at the military college in Great Marlow and at the University of Edinburgh; entered the army in 1807 and served under Wellington in the Peninsular campaign, but retired from the army with the rank of captain of dragoons in 1815. He then took up the study of science at the advice of Sir Humphry Davy and spent years in scientific investigations, particularly in that of geology. In 1825 he became a member of the Geological Society of London, of which he was president in 1831–32 and in 1842–43. His investigations extended through France, England and Wales and he reclassified Palæozoic rocks, giving to his new system the name Silurian in 1835. He also identified the Devonian system. In 1841 he was commissioned by Emperor Nicholas to make a geological survey of Russia and was engaged in that work until 1844, making discoveries which enabled him to present to the scientific world the Permian system. He was one of the founders of the British Association for the Advancement of Science and presided over it in 1846. He was several times elected president of the Royal Geographical Society and from 1862 until his death was continuously reelected. In 1855 he was appointed director of the British Geological Survey. He was knighted in 1846, became a knight commander of the bath in 1853 and a baronet in 1863. The Emperor of Russia conferred on him the grand crosses of Saint Anna and of Saint Stanislaus. He published ‘Geology of Cheltenham’ (1834); ‘The Silurian System’ (1839); ‘Geology of Russia in Europe and in the Ural Mountains’ (1845); ‘Geological Atlas of Europe’ (1856), etc. Consult Geikie, ‘Memoir of Sir Frederick Murchison’ (1875).

MURCHISONITE, a flesh-red variety of the mineral orthoclase, which exhibits golden-yellow reflections when viewed from certain directions. It occurs at Dawlish and Exeter, England, and is named for its discoverer, Sir Roderick I. Murchison.

MURCIA, mėr'shĭ-ạ (Sp. moor'thē-ä), Spain, the capital of the ancient kingdom and modern province of same name, 30 miles northwest of Cartagena, on the Segura, which divides the town into two unequal portions, connected by a handsome bridge. The city is surrounded by a brick wall and is entered by three principal gates. The streets are generally broad, straight and well paved. Among the public buildings the most important is the cathedral, its principal façade a fine combination of Corinthian and composite architecture. It was begun in 1353. In the plaza stands the capacious episcopal palace, built in 1752, one of the finest edifices of its class in Spain, and in close proximity to it the colleges of Saint Fulgentius and Saint Isidore, which form one range of buildings. The bishop takes his title from Cartagena, from which town the see was transferred. The other public edifices and institutions consist of the College of Saint Leander, which is an academy of music connected with the cathedral; the hospital of Saint John, with which is connected a hospital for convalescents; a house of refuge, a foundling hospital, the town-house, an institute for advanced education, a school of design, an ecclesiastical seminary, several nunneries, a bullring, two theatres, an old Moorish granary and a good botanical garden. There are manufactures of coarse cloths and baize of different colors; of silk-stuffs, especially taffeta and plush; linens, hats, gloves, saltpeter; also silk spinning-mills, dye-works, potteries, tanneries, soap-works and about 30 flour-mills. Considerable commerce is carried on in silks and other manufactures, as well as in grain, etc. Pop. about 125,000.

MURDER. See Homicide.

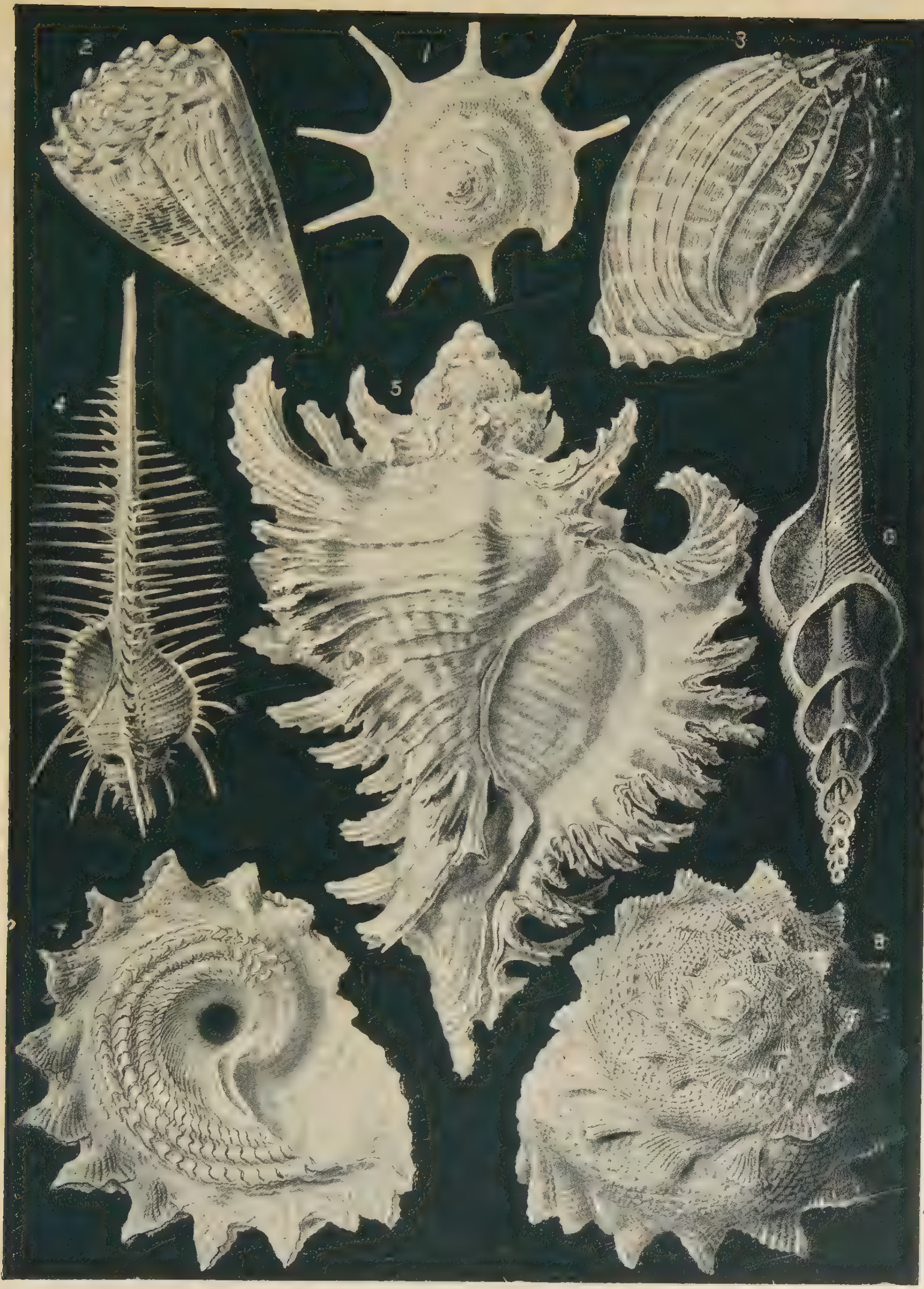
MURDOCH, mėr'dŏk, **James Edward**, American actor: b. Philadelphia, Pa., 25 June 1811; d. Cincinnati, Ohio, 19 May 1893. He made his début as an actor in Philadelphia in 1829, playing Frederick in ‘The Lover's Vow,’ and in 1833 acted with Fanny Kemble during her American tour. In 1838 he appeared in New York as Benedick in ‘Much Ado About Nothing.’ He played Pythias to Edwin Forrest's Damon and in 1842 retired from the stage to study. He reappeared in New York in 1845 as Hamlet and for 15 years played with considerable success in the United States and England. During the Civil War he devoted himself to caring for the wounded soldiers and in giving entertainments for their benefit. Later he became professor of elocution at the Cincinnati College of Music. His best rôles were Hamlet, Mercutio, Benedick and Claude Melnotte, in which he had few equals. He published with William Russell ‘Orthophony’ (1845) and ‘The Stage’ (1885).

MURDOCK, Joseph Ballard, American rear-admiral: b. Hartford, Conn., 13 Feb. 1851. He was graduated (1870) at the United States Naval Academy, then served (1870–74) on the North and South Atlantic stations and was carrying out coast surveys from 1875–79. From 1880–1903 he was instructor of physics at the naval academy. During the Spanish-American War he was executive officer of the *Panther* and became a commander in 1901, captain in 1906, rear-admiral 1909. He commanded the *Rhode Island* in the cruise of the fleet (1907–09) around the world and was commandant at the navy yard, New York, from 1909–10, having command of the second division Atlantic fleet (1910–11), and was commander-in-chief, United States Asiatic fleet (1911–12), retiring 1913. He wrote ‘Notes on Electricity and Magnetism’ (1884) and contributed articles on the same subject to *Proceedings of the United States Naval Institute* and for *Van Nostrand's Magazine*, etc.

MURDOCK, Victor, American legislator: b. Burlingame, Kan., 18 March 1871. He was educated at the common schools and at Lewis Academy, Wichita, and became managing editor of the Wichita *Daily Eagle* (1894–1903). He was elected a Republican to the 58th Congress in 1903, re-elected for 59th to 63d Congresses (1905–15) for the 8th Kansas district and has been a member of the Federal Trade Commission since 1917. In 1918 he was appointed member of the Meat Commission of the United States government. He became an insurgent in his party and joined the Progressives and was chairman of the Progressive National Committee from 1914–16.

MURDOCK, William, Scottish inventor: b. Bellow Mill, near Old Cumnock, 21 Aug. 1754; d. Sycamore Hill, near Soho, 15 Nov.

MUREX



1 Calcar triumphans
2 Conus imperalis
3 Harpa ventricosa
4 Murex tenuispinus
5 Murex inflatus
6 Fusus longicauda
7, 8 Australium imperiale

1839. He went in 1777 to Birmingham, where he obtained employment in the famous engineering establishment of Boulton and Watt, at Soho, near that town. A demand for Watt's pumping engines came from the Cornish mines and Murdock was soon sent thither to superintend the erection and fitting of these engines. In 1800 he was made manager of the works of Boulton and Watt, being afterward admitted as a partner. He retired in 1830. His invention of coal-gas lighting remains his most conspicuous achievement. He began in 1792 his experiments regarding the illuminating properties of gases produced by distilling wood, peat and coal. In 1800 he had an experimental gas apparatus in operation at Soho and in 1802 gas was employed when Soho, London, was illuminated upon the news of the Peace of Amiens. In 1803 the Boulton and Watt foundry was regularly lighted by that means. In February 1808 Murdock read before the Royal Society a paper detailing his investigations. Gas-lighting fell into the hands of promoters and in 1809 Murdock was compelled to publish a vindication of his claims in ‹Letter to a Member of Parliament.› It has been asserted that he invented the steam locomotive but the three engines he made came to nothing.

MUREX, a genus of gasteropod mollusks typical of the family *Muricidæ*, resembling the whelk; shell spiral, rough, with three or more ranges of spines simple or branched. Murices are remarkable for the beauty and variety of their spines. They were in high esteem from the earliest ages on account of the purple dye that some of them yielded. *M. pomum*, which is not so spiny as some of its congeners, is found on our coasts from Cape Hatteras to Texas. It is two to three inches long. The oyster-drill (*Urosalpinx cinerea*), which uses its buccal ribbon to bore into oyster shells, is closely allied to Murex. See PURPLE SHELL.

MUREXIDE, in chemistry, the hydrogen-ammonium salt of a hypothetical acid called «purpuric acid,» the acid itself not being known in the free state. Murexide has the chemical formula $C_8H_4N_5O_6(NH_4)$, H_2O, and about 1855 it was largely used as a dye. The colors that it gives are fast so far as light is concerned, and are quite brilliant; but they tarnish quickly when exposed to sulphur dioxide gas, and hence are more or less fugitive in houses where coal gas is burned. As a dye, murexide has now been replaced by coal-tar colors (q.v.). It may be prepared by oxidizing a mixture of uric acid with nitric acid, evaporating to dryness and moistening the reddish residue with ammonia or ammonium carbonate. The beautiful purple red of murexide is at once developed. (This reaction is used in urine analysis as a test for uric acid). Murexide crystallizes in short four-sided prisms, brownish red in color with green and yellow iridescence, dissolves in water to a beautiful purple solution, the color changing to blue upon the addition of potash. The commercial supply of murexide, when it was used as a dye, was prepared from the uric acid of guano. A dye similar to murexide, and perhaps identical with it, was obtained by the ancients from a gland of the murex, or «purple-fish,» whence the name «murexide.»

MURFREE, mėr′frē, **Mary Noailles** («CHARLES EGBERT CRADDOCK»), American novelist: b. Murfreesboro, Tenn., 24 Jan. 1850. Her early years were spent in Murfreesboro to which after some years in Saint Louis she returned in 1890 and her careful studies of life in the mountains of Tennessee, where her summers have usually been passed, are reflected in nearly all of her books. Her earliest short story appeared in the *Atlantic Monthly* in 1878 and was followed by others over the signature «Charles Egbert Craddock.» Until her identity was revealed in 1885 they were supposed to be the work of a masculine writer. She has published ‹In the Tennessee Mountains› (1884); ‹The Prophet of the Great Smoky Mountains› (1885); ‹Down the Ravine› (1885); ‹The Story of Keedon Bluffs› (1887); ‹His Vanished Star› (1894); ‹The Phantoms of the Footbridge› (1895); ‹The Mystery of Witch-face Mountain› (1895); ‹The Young Mountaineers› (1897); ‹The Story of Old Fort Loudon› (1899); ‹A Sceptre of Power› (1903); ‹Storm Centre› (1905); ‹The Windfall› (1907); ‹The Fair Mississippian› (1908); ‹The Story of Duciehurst› (1914). See IN THE TENNESSEE MOUNTAINS.

MURFREESBORO, mėr′frēz-bŭr-ō, Tenn., city, county-seat of Rutherford County, on the Nashville, Cincinnati and Saint Louis Railroad, about 33 miles southeast of Nashville. The first settlement was made in 1811 and in 1817 it was incorporated. It was the capital of the State from 1819 to 1826. It has had a commission government since 1915. In Murfreesboro are the Middle Tennessee State Normal School and the Tennessee College for Young Ladies (Baptist), founded in 1906. It is in an agricultural section in which cotton is one of the principal products. The city has a number of manufacturing establishments, chief of which are flour and lumber mills, tanneries cotton gins, cotton compresses, machine-shops, red cedar ware factories and carriage factories. On the site of the Stone River battlefield, near the city, is a national cemetery which contains the graves of 6,150 soldiers, 2,333 of unknown dead. (See STONE RIVER, BATTLE OF). It is the birthplace of the author, Mary Noailles Murfree (q.v.). Pop. (1920) 5,367.

MURGER, Henri, ŏṅ-rē mür-zhār, French poet and novelist: b. Paris, 24 March 1822; d. there, 28 Jan. 1861. He entered a lawyer's office, but left it and was for a time secretary to the Russian Count Tolstoi. Of his career in 1838–48 almost nothing is known. He was a member of an informal club or clique of unconventional and impecunious young artists and authors, which was named «Bohemia» and the associates «Bohemians»— a name famous in general literary history. He contributed a great mass of «copy» to numerous periodicals, and at last made a reputation by his ‹Scènes de la vie de bohème› in which he appears as Rodolphe (1848). This was dramatized in 1849, in collaboration with Théodore Barrière, and served as the basis of Puccini's opera, ‹La Bohême› (1898). He then found sufficient to do, wrote dramas for the Luxembourg Theatre and articles for the *Revue des Deux Mondes*. Other works are ‹Scènes de la vie de jeunesse› (1851); ‹Le Pays Latin› (1852); ‹Le dernier rendezvous’ (1852); and ‘Les buveurs d’eau’ (1854). Many of his lyrics are very beautiful and have been translated by Andrew Lang in ‘Ballads and Lyrics of Old France’ (London 1872), and his prose works, especially his masterpiece, are characterized by rare humor and pathos. His general influence, however, was unhealthy, and he personally sank into the depths of dissipation and died in a charity hospital. When a monument was lately erected to his memory there was a considerable amount of protest. Consult the appreciation in Saintsbury's ‘Essays on French Novelists’ (1891) and that by his fellow Bohemians in ‘Les nuits d'hiver’ (Paris 1862). See Boheme, La.

MURGHAB, moor-gäb′, a river of central Asia, which rises on the northern frontier of Afghanistan, in the Paropamisus Mountains, and after a northwestward course of nearly 400 miles loses itself in the desert sands surrounding the oasis of Merv.

MURIACITE. Same as Anhydrite (q.v.).

MURIATIC ACID. See Hydrochloric Acid.

MURICHI, or **MORICHI,** a South American palm of the genus *Mauritia* (*M. flexuosa*), also known as ita-palm; it is nearly related to the *buriti* (q.v.) or wine-palm. These palms reach a height of 100 to 150 feet and grow along the Orinoco River, forming great forests near its mouth. It furnishes to the Indians of that region almost everything; and during much of the year, when the lowlands adjacent to the river are flooded, they dwell among its branches, like monkeys, for want of dry land upon which to rest or travel. «At the time of the inundations,» says Humboldt, «the tufts of the fanleaved murichi present the appearance of a forest issuing from the bosom of the waters. The navigator, traversing at night the branches of the Orinoco delta, sees with surprise the crowns of these palms lighted up by large fires. These are the habitations of the Guaranis suspended from the trunks of the trees. These people stretch mats in the air, fill them with earth and on this bed of wet clay light what fires they require for household purposes. For ages they have owed their liberty and political independence to the treacherous and miry nature of their soil, which they traverse in seasons of drought and over which they alone know how to pass in safety; to their isolation in the delta of the Orinoco, and to their living in the trees.» Consult von Humboldt, ‘Voyage aux Régions Equinoxiales,’ Vol. VIII (1807–27).

MURIDÆ, the family of mice and rats (qq.v.).

MURILLO, mū-rĭl′ō (Sp. moo-rēl′yō), **Bartolomé Estéban,** bär-tō′lō-mā ās-tā′bän, Spanish painter: b. Seville, 31 Dec. 1617; d. there, 3 April 1682. He began his art education under Juan del Castillo, and in 1642 sought wider experience in Madrid, where his townsman Velasquez was enjoying a brilliant career. By the latter he was dissuaded from a contemplated visit to Rome and secured facilities for studying in the Royal Galleries and in the Escorial. Here he placed himself for three years under the inspiration of Ribera, Titian, Rubens, Vandyke and Velasquez himself. In 1645 he returned to Seville where he undertook to paint 11 separate pictures for the cloister of Saint Francis in illustration of Franciscan history. These works proved the foundation of his renown. The principal pieces of this series are ‘Saint James Distributing Alms’ (now in the Academy Fernando, Madrid); the so-called ‘Angel Piece’ (in the Louvre); ‘The Death of Saint Clara’ (in the Dresden Gallery). These strike the note of the early Seville school, being warm in tone, and exhibit Murillo as drawing his types of beauty from the lower orders of the Spanish people. Of even more transparent coloring are his ‘Saint Leander and Isidore’ in the sacristy of the cathedral at Madrid; ‘The Birth of Mary’ (in the Louvre); and the ‘Vision of Saint Anthony’ (in Seville Cathedral, 1656); both of these latter belong to the middle period of his artistic development. In 1665 he began his four pictures for the church of Santa Maria pa Blanca, among them being his ‘Church Triumphant’; ‘The Immaculate Conception’ (in the Louvre); and ‘The Foundation of the Church of Santa Maria Maggiore at Rome’ (in the Madrid Academy). In 1668 he painted his ‘Madonna Hovering in the Clouds Surrounded by Eight Saints of Seville’ (in the chapter-house of Seville Cathedral); and about 1670 his ‘Holy Family with Elizabeth and The Infant Baptist’ (in the Louvre). His most brilliant period was between 1670 and 1680; and in 1674 he had completed the eight vast pictures illustrating the ‘Corporal Works of Mercy.’ These were intended for the church of the Caridad Hospital, and are remarkable for splendor of coloring and strength of design; the faces are lifelike in expression and the composition and perspective faultless. His ‘Saint Elizabeth of Hungary Nursing the Sick’ (in the Madrid Museum) belongs to this period. In 1676 he executed 20 pictures for the Capuchin monastery at Seville, 17 of which are now in the local museum. It was at this time he painted the famous ‘Immaculate Conception’ which Maréchal Soult took to France and sold to the nation for 615,000 francs. It is now in the Louvre, and is the work by which this painter is most popularly known. While Murillo was engaged at Cadiz in painting ‘The Betrothal of Saint Catherine’ for the high altar of the Capuchin Church, he fell from the scaffolding and died as the result of his injuries. The work was completed by his pupil Osorio with no particular success.

Murillo left about 400 pictures, including his devotional paintings and the many representations of the ‘Immaculate Conception,’ one of his favorite and characteristic subjects. His most important works in the United States are the altar-piece in the cathedral of Saint Peter's at Cincinnati and ‘Gallegas at the Window’ in the Widener collection, Philadelphia. He was the greatest of Spanish religious painters because his Madonnas are real Spanish women and only raised by the magic of his brush into sainthood or apotheosis. But he was a great genre painter also. He knew the gypsies and beggars of Spain as well as he knew the saints. He could paint landscape and portrait, flowers and fruit, maidens and children of that Seville which he loved so well and never left for France or Italy. Unswayed by the influence of the dazzling schools of Tuscany or Flanders he has confined himself to Spanish faces, to Spanish atmosphere and scenery, and has realized a manner and color of his own. If he sacrificed in this way anything of vigor or variety he gained far more in originality, sincerity, verisimilitude and an individuality which is truly national.

Consult Calvert, A. F., ‹Murillo, a biography and appreciation› (New York 1907); Hurll, E. M., ‹Murillo› (Boston 1901); Tubino, F. M., ‹Murillo, su epoca, su vida, sus quadros› (Seville 1864); Lefort, P., ‹Murillo et ses élèves› (Paris 1892).

MURLIN, Lemuel Herbert, American clergyman: b. Mercer County, Ohio, 16 Nov. 1861. He was graduated (1891) at De Pauw University and studied (1896) at the University of Pennsylvania and (1897) at Clark University, then in Europe (1898). He received the degree B.D. at Garrett Biblical Institute (1899). He was teacher at the public schools and in Fort Wayne College (1877–86), pastor of churches in Fort Wayne, Knightsville and Vincennes, Ind. (1886–94). From 1894–1911 he was president of Baker University, Baldwin, Kan., and president of Boston, Mass., University from 1911. During 1909 and 1911 he was acting pastor of the American Church at Berlin. He has been a member of the General Conferences of the Methodist Episcopal Church in 1900, 1904 and 1916 and of the Ecumenical Conferences at London (1901) and Toronto (1911).

MURMANSK, a new town in the extreme northwest of Russia, on the Kola Peninsula and the northern terminus of the Kola-Petrograd Railroad. Situated on a sheltered, ice-free harbor on the Murman Coast, the town has sprung into existence and importance during the European War. In appearance it resembles a Klondike mining camp; its position, 150 miles north of the Arctic Circle, gives it a severe winter temperature of 30° below zero. The population, stated to be about 7,000 (1918), live in roughly-built frame shacks and are largely composed of refugees from Finland as well as Russia. With the defection of Russia as an active participant in the war, the Allies ceased using Archangel as a port for unloading provisions and war materials and as the only line of communication with the former Russian government. To this circumstance is due the rise of Murmansk. With the spreading anarchy promoted by the Bolsheviki and the German encroachments on Russian territory during 1917 and 1918, the town grew in importance and value as a strategical point to the Allies. In the absence of an effective government in Russia, the isolated position of Murmansk and its long distance from the centres of turmoil enabled the Allies to keep in unofficial communication with the country. According to an American correspondent, the Murmansk Bolsheviki lived on excellent terms with the Allied naval and military men, owing to the fact that they derived nearly all their supplies from British and American vessels. Money was stated to be of little value; food, shoes, clothing and tobacco could purchase any local product, such as furs and live reindeer. See RUSSIA; WAR, EUROPEAN.

MURNER, moor′nĕr, **Thomas,** German satirist and opponent of the Reformation: b. Strassburg, 24 Dec. 1475; d. about 1536. He studied at the principal universities of Europe, devoting himself particularly to theology and philosophy, and early gained a reputation for ability, marred however by a quarrelsome disposition. He led an unsteady life, preaching for some time at Frankfort-on-the-Main and other places, but incurring generally the displeasure of his congregations by the coarse personalities of his sermons, and was successively expelled from Freiburg, Treve and Venice. He became one of the most virulent opponents of the Reformation. Some of his writings against the Reformation were burned by order of the Diet of Worms; and he was compelled to flee to Switzerland, whence he was in time likewise expelled. The latter part of his history is not known. In 1506 he had been crowned as poet laureate by the Emperor Maximilian; and his ‹Narrenbeschwörung› (1512), of which his ‹Der Schelmenzunft› (1516) may be regarded as a continuation, is one of the most remarkable imitations of Sebastian Brant's celebrated satirical poem entitled ‹Narrenschiff.› He wrote ‹Chartiludium logice,› etc. (1507), and other Latin works; prepared a German version of Virgil and other translations; and was also regarded as the editor of ‹Eulenspiegel.› But he is chiefly remembered by his writings against Luther and the Reformation. His most celebrated satirical work is entitled ‹Von dem grossen Lutherischen Narren› (1522; new ed., 1848). Consult Goedeke, ‹Murners Narrenbeschwörung› (1879); Kawerau, ‹Thomas Murner und die Kirche des Mittelalters› (1890); Lappenburg, ‹Murners Eulenspiegel› (1854); Ries, W., ‹Quellenstudien zu Murners satirisch-didakitschen Dichtunzen› (Berlin 1890); Schatz, H., ‹Stemmungen und Effekte in Murners Dichtungen› (Kiel 1909).

MUROM, moo′rôm, Russia, town in the government of Vladimir, located on the Oka and Kovrov-Murom Railway. It has a cathedral, theatre, city bank, high school, etc. Among its industries are large linen weaving factories and trade in grain. This was a very important trading town in the 10th century. Its population is about 18,616.

MURPHEY, Archibald De Bow, American jurist: b. Caswell County, N. C., 1777; d. Hillsboro, N. C., 3 Feb. 1832. He was graduated from the University of North Carolina in 1799 and was for the three succeeding years professor of ancient languages there. He studied law and was admitted to the bar in 1802 and established a large practice. He was a member of the State senate in 1812–18 and proved himself an able legislator, advocating internal improvements and working earnestly to enlarge and improve the educational system of the State. In 1818 he was a judge of the Superior Court and in 1819–20 was a justice of the Supreme Court of North Carolina. He published ‹Memoir of Improvements Contemplated and the Resources and Finances of the State› (1819); ‹Reports of Cases in the Supreme Court of North Carolina in 1804–13 and 1818–19› (1821–26), etc.

MURPHY, Arthur, British dramatist: b. Clooniquin, near Elpin, County Roscommon, Ireland, 27 Dec. 1727; d. 18 June 1805. He was educated at the Roman Catholic College of

Saint Omer, France, and was subsequently employed in a London banking house. His first drama, which appeared in 1756, was entitled ‘The Apprentice.’ In 1758 appeared ‘The Upholsterer,’ a farce directed against politicians, which proved very successful, followed by ‘The Orphan of China’; ‘The Way to Keep Him’; ‘All in the Wrong’; ‘The Citizen’; ‘The Old Maid’; ‘Three Weeks after Marriage’; ‘Zenobia’; ‘The Grecian Daughter,’ etc. At various times in his life he engaged in political controversies, and edited journals opposing Mr. Fox, the first Lord Holland and Wilkes' *North Briton*. He also edited the works of Fielding, wrote an essay on Dr. Johnson, translated Tacitus, and wrote a ‘Life’ of Garrick. His plays are his best performances, and some of them, including ‘The Way to Keep Him’ and ‘Three Weeks after Marriage,’ long kept the stage.

MURPHY, Charles Francis, American politician: b. New York, 20 June 1858; d. there, 25 April 1924. He received a public school education, and soon became interested in politics. As organizer and member of the Sylvian Club and through his fame as an athlete he gained a wide personal acquaintance. He opened a series of saloons which he held to be practically poor men's clubs. He showed decided talents as a political organizer and in 1891 became the Tammany leader of his assembly district. In 1897–1901 he was a commissioner of docks and ferries in New York, served for a time as chairman of Tammany Hall and on the retirement of Richard Croker in 1902 succeeded him as chief. In 1903 and 1905 he led his party to victory in the mayoralty campaigns, which elected George B. McClellan as mayor. In 1904 Murphy opposed the nomination of Alton B. Parker for the Presidency and in 1906 supported William R. Hearst for governor, the latter's defeat being regarded as a severe defeat for Murphy. In 1909 the Tammany Hall nominee for mayor, W. J. Gaynor, was the only successful candidate on the Democratic ticket, the Fusionists having captured the remaining offices. Many thought that this reverse would compel Murphy's retirement, but to the despair of the political prophets he continued as chief. In 1910 the election of John A. Dix to the governorship was supposed to be due to Murphy's influence with the up-State Democrats and that as a result his power had become paramount in the Democratic party throughout the State. The succeeding years brought sharp criticism to Tammany and its leader because of several scandals regarding highway and canal contracts. Boss rule now became a State issue and his opponents held up Murphy as an example of everything vicious in the boss system. This, however, came with a bad grace from Republicans, themselves the most notorious upholders of the system. In 1912 Murphy supported Wilson after the nomination of the latter although he favored Harmon and Clark in the early stages of the convention. He was a presidential elector the same year. In State politics it appears that Murphy took little part in the nomination of Sulzer; friction developed after election and Tammany was by many believed to have been the real factor in the impeachment and removal of Sulzer in 1913. The mayoralty campaign of 1913, in which Edward E. McCall was the Tammany nominee, was exceedingly bitter, and Murphy was violently assailed by the Fusionists. He remained imperturbable, however, and retained the position of chief despite the defeat that year and that in the gubernatorial contest of 1914. In 1917 the Tammany candidate for mayor, Judge Hylan, was elected by a great majority and Murphy's leadership continued unimpaired. Mr. Murphy's philanthropies were extensive, but he refused to have his charitable activities advertised, and this side of his character was known to comparatively few persons.

MURPHY, Francis, American temperance evangelist: b. Wexford, Ireland, 24 April 1836; d. Los Angeles, 30 June 1907. During the Civil War he served in the Union army. In 1870, at Portland, Me., he began the organization of temperance reform clubs, which were established in all parts of the State, and of which he was the first president. He made his headquarters in Pittsburgh, Pa., where, after his first address, in 1876, the pledge was signed by 45,000 people; and before long the signatures secured throughout the United States in response to his endeavors numbered as many as 10,000,000. His labors were also carried into England with noteworthy results. During the Spanish-American War he served as chaplain in the United States army.

MURPHY, Franklin, American manufacturer and politican: b. Jersey City, N. J., 3 Jan. 1846; d. Newark, N. J., 24 Feb. 1920. In 1856 the family removed to Newark which had been the home of his ancestors from its original settlement in 1656. He enlisted in the Federal army in 1862 at the age of 16 as a member of Company A, 13th New Jersey Volunteers. This regiment was assigned to the 12th, afterward the 20th, corps, which constituted a part of the Army of the Potomac and which was afterward transferred to the west, becoming part of Sherman's army in his march to Atlanta and the sea. At the close of the war he established at Newark a varnish business which has since become widely known. He began his political career in the early '80s, occupying various minor city and State offices until 1901, when he was elected governor of New Jersey for three years. His term as governor was noted for the passage of the first State primary law (not the open primary as invented later), improvement in the child labor laws and general improvement in labor legislation, a tenement-house law and a law requiring banks to pay interest on deposits of State moneys. He was chairman of the Republican State Committee for 20 years, beginning with 1892, and was a delegate to many Republican national conventions, and also was a member of the National Committee from 1900. He was commissioner to Paris Exposition of 1900. Mr. Murphy was a member of the Society of the Cincinnati, of the Colonial Wars and the Sons of the American Revolution, of which latter he was president-general. He was a member of the board of managers of the National Soldiers' Home, and at one time president of the board. In the National Republican Convention of 1908 he received 158 votes for Vice-President. He was a member of the Essex County, N. J., park commission for 20 years, and continued actively interested in the affairs of his home city of Newark and his State.

MURPHY, Henry Cruse, American politician and historian: b. Brooklyn, N. Y., 5 July 1810; d. there, 1 Dec. 1882. He was graduated at Columbia in 1830, studied law, was admitted to the bar in Brooklyn, became city attorney there and in 1842 was elected mayor. In 1843 he was elected to Congress; was a delegate to the New York Constitutional Convention in 1846; and in 1847 re-entered Congress. In 1852 he was a candidate for the Democratic nomination for President. From 1857 to 1861 he served as United States Minister to Holland. He became well known as a journalist, being for some time editor of the Brooklyn *Eagle;* and through the publication of his studies in the colonial history of New York valuable documents were brought to light. He translated from the Dutch De Vries' ‹Voyages from Holland to America, 1632 to 1644› (1853), and his other publications include ‹Henry Hudson in Holland: Origin and Objects of the Voyage which Led to the Discovery of the Hudson River› (1859); ‹Jacob Steendam, Noch Vasater› (1861); ‹Anthology of the New Netherlands› (1865), and ‹The Voyage of Verrazzano› (1875).

MURPHY, John Benjamin, American surgeon: b. Appleton, Wis., 21 Dec. 1857; d. 11 Aug. 1916. He graduated (1879) at Rush Medical College, Chicago, and practised medicine (1879–82) at Chicago, then studied (1882–84) in Germany, to resume his practice in Chicago. He was head of the department of surgery and clinical surgery at Northwestern University Medical College and chief surgeon to Mercy Hospital, but (1908) joined the United States medical corps as 1st lieutenant. He invented the anastomosis button which simplifies the technique in abdominal operations and reduces the fatalities. He has written ‹Gunshot Wounds of the Abdomen›; ‹Actinomycosis Hominis,› he was the first in America to recognize the disease; ‹Original Experimental and Clinical Research,› which illustrates the use of his anastomosis button; ‹Surgery of the Stomach.› For his great services he was decorated with many honors, such as LL.D., University of Illinois (1905), and Catholic University of America, Washington; M.Sc., University of Sheffield. England (1908), etc. He edited ‹General Surgery› for the «Practical Medicine Series» from 1901.

MURPHY, John Francis, American painter: b. Oswego, N. Y., 11 Dec. 1853; d. New York, 30 Jan. 1921. He came to New York in 1875 and gave especial attention to landscape painting. His first picture to appear in the National Academy of Design was exhibited in 1876, and from 1887 he was a National Academician. His painting ‹Tints of a Vanished Past› gained the Haligarten prize (1885). In 1887 he was awarded the Webb prize by the Society of American Artists, of which he was a member. He also received a gold medal at Charleston (1902), and in 1910 the Inness medal.

MURPHYSBORO, Ill., city, county-seat of Jackson County, on the Big Muddy River, and on the Mobile and Ohio, the Saint Louis Valley and the Illinois Central railroads, about 140 miles south ot Springfield. It is situated in an agricultural section, and nearby are coal-fields, timber and building stone. The chief industrial establishments are foundries, machine-shops, flour and lumber mills and brick and tile yards. There is a large trade in farm and dairy products, coal and lumber. Murphysboro has a commission form of government. Pop. (1920) 10,411.

MURRAIN, loosely, any widely prevailing and contagious disease among domestic animals. The term is applied to various specific disorders in different localities, but more particularly to the epizootic diseases, especially those of cattle. Still more strictly it is limited to the plague commonly known as the foot-and-mouth disease (aphthous fever), which attacks cattle and other animals, causing loss of appetite, febrile disturbance, lameness, vesicular eruptions on the feet and in the mouth, etc., with frequent complications. See ANTHRAX; CATTLE-PLAGUE; RINDERPEST.

MURRAL, one of the snake-headed, or walking, fishes of India (*Ophiocephalus marulius*), regarded as one of the best fresh-water table-fishes of the East. It abounds in rivers and inland waters, especially the «tanks» so numerous in Madras, and may reach a weight of 20 pounds, although usually far smaller than that. It is caught with live bait, not rising readily to a fly, and affords excellent sport to skilled anglers.

MURRAY, mŭr'ā, **Alexander,** American naval officer: b. Chestertown, Md., 1765; d. Philadelphia, 6 Oct. 1821. In 1776 he received a commission in the then half-organized navy, and while waiting for sea duty entered the army, serving (1776–77) as lieutenant and captain in the 1st Maryland regiment, and participating in the actions and operations near New York. Toward the end of 1777 he was given command of the *Revenge,* with letters of marque; was captured by the British, exchanged, served with distinction on the *Trumbull;* was again captured and exchanged; then took command of a privateer, and served later on the *Alliance.* In 1798, on the reorganization of the navy, he was appointed captain and during the difficulties with France commanded the *Montezuma.* Transferred to the *Constellation,* he served in the Mediterranean during the war with Tripoli, in which he initiated actual hostilities by attacking a flotilla of the enemy. After that war he was mainly engaged in shore duty at Philadelphia until his death.

MURRAY, George Gilbert Aimé, British classical scholar: b. Sydney, New South Wales, 2 Jan. 1866. He was taken to England in 1877 and educated at Merchant Taylors' School, London, then studied at Saint John's College, Oxford. He was made (1888) a Fellow of New College, Oxford, and was professor of Greek at Glasgow University 1889–99. Since 1908 he has been regius professor of Greek at Oxford University. Numerous degrees have been conferred on him, as LL.D., Glasgow, D. Litt., Birmingham, D. Litt., Oxford, F.R.S.L., etc. In 1914 he was appointed trustee of the British Museum. He has written ‹History of Ancient Greek Literature› (1897); ‹The Foreign Policy of Sir Edward Grey› (1915); ‹Rise of the Greek Epic› (1907–11); ‹Four Stages of Greek Religion› (1913); ‹The Rhesus of Euripides› (1913); ‹The Alcestis of Euripides› (1914). He was part author of ‹Liberalism and the Empire› (1900). His plays ‹Carlyon

Sahib› (1899) and Andromache› (1900) have been successfully performed on the stage. Of his verse translations for which he is noted are ‹Hippolytus,› ‹Bacchæ,› ‹Trojan Women,› ‹Electra,› ‹Medea.› For ‹Iphigenia in Tauris,› which appeared at the Court Theatre, London, the highest comment of the critics was worthily gained. ‹Trojan Women› and ‹Iphigenia› have been played on the boards of American colleges and also *al fresco.*

MURRAY, George Henry, Canadian politician: b. Grand Narrows, Nova Scotia, 7 June 1861. He was educated in Grand Narrows and in Boston University and was admitted to the bar in 1883. He was appointed to the legislative council of Nova Scotia in 1889, but resigned in 1891, and in the same year became a member of the provincial cabinet without portfolio, under the Hon. W. S. Fielding, and in 1896 became premier and provincial secretary of Nova Scotia under a Liberal administration. He was elected to the Dominion Parliament in 1897, where he still (1917) sits.

MURRAY, Grenville, («EUSTACE CLARE»), English journalist: b. 1824; d. Passy, France, 20 Dec. 1881. He was a natural son of Richard Grenville, second Duke of Buckingham. He was in the diplomatic service from 1851 to 1868, but was guilty of irregular practices, and was generally in discord with his superiors or with British residents. From 1869 he lived in France, where he was Paris correspondent of the *Pall Mall Gazette* and the *Daily News,* and an early contributor to the *Cornhill.* He was one of the ablest journalists of his time and the initiator of «yellow» methods in English newspapers, being horsewhipped by Lord Carrington in 1869 for a libel that appeared in *The Queen's Messenger,* a paper he conducted. He lived in Paris as the Comte de Rethel d'Aragon, using the title of his wife, a Spanish woman. A voluminous writer, among his works were ‹The Roving Englishman,› chapters of travel (1854); ‹Embassies and Foreign Courts› (1855); ‹The Member for Paris› (1871); ‹Young Brown› (1874); ‹Turkey› (1877); ‹The Russians of To-Day› (1878); ‹Under the Lens: Social Photographs› (1885).

MURRAY, James, Scottish soldier: b. about 1725; d. 1794. He was a son of the fourth Lord Elibank, and about 1740 entered the army; came with his regiment to America in 1757; at the siege of Louisburg (1758) commanded a brigade; and in the battle on the Heights of Abraham (13 Sept. 1759) led the left wing of the army under Wolfe. In 1760 he held Quebec against superior numbers of the French, in the same year served with Amherst in the reduction of Montreal and was made governor of Quebec. From 1763 to 1766 he was governor of Canada; in 1774 became governor of Minorca; was compelled to surrender Fort Saint Philip to the French, in 1782, after a heavy siege, and upon returning to England was court-martialed and acquitted. In 1783 he was made a full general in the British army. Consult Parkman, ‹Montcalm and Wolfe› (1884, 1898).

MURRAY, James Augustus Henry, Scottish philologist and lexicographer; b. Denholm, near Hawick, Roxburghshire, 1837; d. 26 July 1915. He was graduated B.A. of London University, from 1855 till 1858 was an assistant master in Hawick Grammar School, becoming in the latter year master of Hawick Academy, for a few years was foreign correspondent to the Oriental Bank in London, and from 1870 till his removal to Oxford in 1885 a master at Mill Hill School. Meantime he had become well known as a philologist. He was president of the Philological Society in 1878–80 and 1882–84. On the death of Dr. Furnival, Dr. Murray became in 1879 general editor of the ‹New English Dictionary on Historical Principles,› the great work issued under the auspices of the Philological Society from the Clarendon Press, Oxford. He was assisted by a staff of from 20 to 30 editors, and thousands of volunteer assistants, who read every book published before 1500 A.D. and the principal books since that date, thus obtaining many millions of illustrative references for use in the work. He had almost completed the tenth and last volume, T to Z, when he died. His aims in connection with this vast undertaking are embodied in an address to the Philological Society in 1879. Other works by him are ‹A Week among the Antiquties of Orkney› (1861); ‹Dialects of the Southern Counties of Scotland› (1873); ‹Synopsis of Paley's *Horæ Paulinæ*› (1872); ‹The Romance and Prophecies of Thomas of Ercildoune› (1875); the article ‹English Language› in the ‹Encyclopædia Britannica› (9th ed.), and many papers on the archæology, natural history, geology and language of the border counties of Scotland. In 1884 he was awarded a civil list pension of £270 per annum. In 1900 he was appointed Romanes lecturer at Oxford and he was knighted in 1908.

MURRAY, or MORAY, James Stuart, EARL OF. See STUART, JAMES.

MURRAY, SIR James Wolfe, British lieutenant-general: b. 13 March 1853. He was educated at Harrow, then entered military service at Woolwich and joined (1872) the Royal Artillery. He became colonel in 1899, served (1895) in the Ashanti campaign and in Natal (1899–1900), to become (1903–04) quartermaster-general in India. He was master-general of the Ordnance from 1904–07, commanded the 9th division in India from 1907–11, then commanded in South Africa in 1914. He was created K.C.B. in 1900. From 1914–15 he was 1st Military Member of the Army Council.

MURRAY, John, American clergyman, founder of American Universalism: b. Alton, Hampshire, England, 10 Dec. 1741; d. Boston, Mass., 3 Sept. 1815. He was brought up in Ireland, where he joined the Methodist congregation and did some preaching, but in 1760 went to England, came under the influence of James Relly and was excommunicated by Whitefield. He came to America in 1770; preached in Newport, Boston and Portsmouth his peculiar doctrines, which agree with modern Universalism only in the belief of universal salvation, but otherwise held to the dogma of the Trinity, of personal devil and of the incarnation; and at the outbreak of the Revolution was chaplain of a Rhode Island brigade for a short time, during which his resignation was demanded by the orthodox chaplains in the army. He formed a Universalist church in Gloucester, and in 1783 recovered property belonging to his parishioners which had been seized by the parish authorities, who acted on the ground that the Universalists had no corporate existence; the success of this suit was a distinct advance in congregational freedom in New England. At his death he was in charge of the Universalist Society of Boston. He wrote ‹Letters and Sketches› (1812) and an ‹Autobiography,› continued and edited by his wife (1816).

MURRAY, John, English publisher: b. London, 27 Nov. 1778; d. there, 27 June 1843. JOHN MURRAY the second was the son of John MacMurray (1745–93), a descendant of the Murrays of Atholl, who commenced business as a publisher in London in 1768, dropping the prefix to his name. He began business in 1799, early attained success and became the friend of, as well as publisher for, some of the chief writers of the day, including Byron, Moore, Rogers, Campbell, Crabbe, Washington Irving, George Borrow and Benjamin Disraeli. He started the *Quarterly Review* in February 1809 in opposition to the Whig *Edinburgh Review,* of which Gifford, S. T. Coleridge and Lockhart were editors, and Scott and Southey contributors. By 1817 the *Quarterly* was a great success. In 1824 Murray was involved in the controversy with Moore regarding the destruction of Byron's ‹Memoirs›; and in 1826 undertook the publication of the *Representative,* a daily newspaper, which, after running six months was discontinued at a loss of $130,000. Consult Moore, ‹Life of Byron› (1830), and Smiles, ‹A Publisher and his Friends› (1891). The third JOHN MURRAY (1808–92) was the projector of the famous series of guidebooks that bears the firm's name. He was present at the Theatrical Fund banquet at Edinburgh in 1827 when Scott avowed himself the author of ‹Waverley.› The fourth JOHN MURRAY (b. 1851) is the present head of the firm.

MURRAY, SIR John, Canadian scientist: b. Coburg, Ontario, 3 March 1841; d. Kirkliston, near Edinburgh, 31 March 1914. He was educated at Edinburgh University. In 1867 he accompanied for biological purposes an expedition to Spitzbergen and Greenland, and from 1871 to 1876 he served under Sir Wyville Thomson as one of the scientific staff of the *Challenger* expedition. From 1876 till 1882 he was chief assistant editor of the scientific reports published in connection with that voyage, and in the latter year became editor-in-chief, liberally supporting the work out of his own means. He defrayed the expenses and accompanied the Michael Sars expedition to the north Atlantic (1910), the literary fruits of which were ‹The Depths of the Ocean› (1912) and ‹The Ocean: a General Account of the Science of the Sea› (1913). He was killed in an automobile accident. He was knighted in 1898. Besides editing the *Challenger* reports he wrote a large number of papers on geographical, oceanographical and biological subjects, and at his own expense established oceanographical laboratories in Scotland.

MURRAY, John Clark, Canadian educator: b. Paisley, Scotland, 19 March 1836. He was educated in the universities of Edinburgh and Göttingen, and in 1862 accepted the chair of philosophy in Queen's University, Kingston, Canada. Since 1872 he has been professor of moral philosophy in McGill University, Montreal. He has published ‹Outlines of Sir W. Hamilton's Philosophy› (1870); ‹The Ballads and Songs of Scotland› (1874); ‹A Handbook of Psychology› (1885); ‹An Introduction to Ethics› (1901), etc.

MURRAY, John O'Kane, American historian: b. Glenariffe, Ireland, 12 Dec. 1847; d. Chicago, Ill., 30 July 1885. He removed to the United States where he became a physician and author of some repute. His most important work was a ‹Popular History of the Catholic Church in America› (1876), and among his other books are ‹The Catholic Heroes and Heroines of America› (1878); ‹Lessons in English Literature› (1883), etc.

MURRAY, Lindley, American grammarian, son of M. L. Murray (q.v.): b. Swatara, Lancaster County, Pa., 22 April 1745; d. Holgate, near York, England, 16 Feb. 1826. He studied law (1761–65) and practised as a barrister; but after the Revolution quitted the bar for a commercial speculation, and having realized a fortune went, in 1784, to England for reasons of health and settled at Holgate, near York. His ‹English Grammar› (1795) met with a truly enormous success, being almost universally introduced as a textbook in England and the United States, and for years was regarded as the standard authority. It passed through nearly 50 editions in its original form. A corrected edition by the author was published in 1816, and his abridgment (1818) of this went through 150 editions, each of 10,000 copies. His work was far from accurate, however, and was soon superseded; but it freed a difficult subject from chaos. He wrote ‹English Exercises,› the ‹Key› and ‹English Reader› (1799), and a ‹Spelling Book› (1804) which went through 50 editions. He was also a botanist and his gardens were renowned. In 1787 he published ‹Power of Religion on the Mind.› Consult Egle, ‹Life› (New York 1885), and an autobiography edited and continued by Frank (1826).

MURRAY, Mary Lindley, American heroine: b. Pennsylvania; d. New York, 25 Dec. 1782 (O. S.). She is known through an incident of the Revolution. On 15 Sept. 1776 the British line of march passed her residence, «The Grange,» a small country-seat at Murray Hill, New York. Putnam, having evacuated New York, was at the same time marching along the Bloomingdale road near the North River, intending to join Washington at Harlem Heights. Howe thought by marching across the island to cut off the American retreat. He was, however, invited, with his officers, to luncheon at «The Grange» by Mrs. Murray, accepted and remained more than two hours, during which time Putnam escaped. A bronze tablet in commemoration was placed in the parked enclosure on Park avenue below 37th street on Evacuation day (25 Nov.) 1903.

MURRAY, William, EARL OF MANSFIELD. See MANSFIELD, WILLIAM MURRAY, EARL OF.

MURRAY, William Vans, American diplomat: b. Maryland, about 1762; d. Cambridge, Md., 11 Dec. 1803. He received a classical education and after peace was declared in 1783 he went to London and studied law. He returned to the United States in 1785 and established a law practice in Maryland. In 1791–97 he served in Congress where he gained a reputation as a learned and skilful legislator, and in 1797 was appointed by Washington Minister to the Netherlands. He was envoy to France in 1800 and was chiefly instrumental in concluding the treaty between the United States and that country. He then returned to the Ministry at The Hague and remained there until 1801, when he retired from public life. He published 'The Constitutions and Laws of the United States.'

MURRAY, the largest river of Australia, rising in the Australian Alps, its sources being partly in New South Wales, partly in Victoria. It flows for a long distance westward, forming the boundary between these two colonies, then passes into South Australia, where it takes a southern direction and falls into the Indian Ocean at Encounter Bay, 39 miles southeast of Adelaide, after passing through a large shallow sheet of water called Lake Alexandrina. Its total length is about 1,300 miles. Its chief affluents are the Murrumbidgee and Darling. It is navigable by light draft steamers in the wet season for the greater part of its course to Albury, 190 miles northeast of Melbourne.

MURRAY BAY, or **MALBAIE,** Canada, the county town of Charlevoix County, Quebec, on a bay of the Murray estuary, near the north bank of the Saint Lawrence River, 90 miles east of Quebec. It has lumber industries and its dependent suburbs, Pointe à Pic and Cap à l'Aigle, at each end of the bay, are popular summer resorts, the surrounding country being very attractive and affording angling, rowing, bathing and other facilities. Steamboats connect with Quebec. During the Revolutionary War Murray Bay was a station for United States prisoners of war. Pop. about 1,500.

MURRAY'S TRANSLATIONS OF EURIPIDES. George Gilbert Murray, since 1908 regius professor of Greek at Oxford University, was born in Sydney, N. S. W., in 1866, went to England in 1877 and became professor of Greek at Glasgow in 1889. Besides his work as a translator, he has edited a critical edition of Euripides, and is the author of 'A History of Greek Literature,' 'Four Stages of Greek Religion,' 'Euripides and His Age' and many essays on ancient and modern subjects. His translations of Euripides include the 'Hippolytus,' the 'Bacchæ,' the 'Trojan Women,' the 'Electra,' the 'Medea,' the 'Iphigenia in Tauris,' the 'Rhesus' and the 'Alcestis.' Like Browning's version of the 'Alcestis' in Balaustion's Adventure (1871), Way's translation of Euripides entire (1894–98), revised and republished in the 'Loeb Classical Library' (1912), and Verrall's editions and essays in the «rehabilitation» of Euripides, begun in 1881 and continued for 30 years, Murray's work in Euripides is at the same time a manifestation of revived interest in the ancient dramatist and a factor in his reinstatement as a great artist. His translations are distinguished (1) by the rendering of the iambic trimeter of the episodes into English rhymed heroics instead of the traditional blank verse; (2) by variety and grace of metre in the choral parts; (3) by the use of stage directions which contribute remarkably to the reader's imagination; (4) by a poetic fancy which so suffuses the whole with color and spirit as to give it a creative quality rare in translation, and (5) by flowing and harmonious language of great charm. The employment of rhymed heroics instead of blank verse, which is the natural vehicle of drama in English as the iambic trimeter is of drama in Greek, may be criticised as interfering with spontaneity and accuracy, and it may be said also that the use of rhyme in both episode and chorus lessens the distinctness of separation between the two in the original; but the loss in these respects is not great, and is more than compensated by the richness of fancy resulting from the translator's ingenious conquests of the difficulties presented by rhyme. Murray is at once poet, scholar and dramatist, and his translation is in marked contrast with that of uninspired scholarship alone.

Grant Showerman.

MURRE, mėr, or **MURRELET,** an auk (q.v.) of the genera *Uria cepphus,* and related groups; a guillemot. They are small, black-and-white, web-footed, diving, fish-eating birds, which abound on all rocky northern coasts, breeding on sea-fronting ledges, where each pair produces a single, large, pyriform, variously colored egg, which is not placed in a nest but incubated in turn by the parents, who lift it from the ground upon their webbed toes and warm it between their downy legs. Several diminutive and handsomely ornamented species of the coasts of the north Pacific are called murrelets. Consult Baird, Brewer and Ridgway, 'North American Water-Birds' (1884); and the writings on Arctic ornithology of Fielden, Nelson, Turner, Murdock, etc.

MURRINE VASES are antique vessels, distinguished for costliness of material and beauty of execution. They were brought by Pompey from Asia to Rome, and bore an immense price. Some antiquarians have supposed them to have been made of a mineral of the class of sardonyx or agate, or of a kind of porcelain or glass.

MURRUMBIDGEE, mŭr-ŭm-bĭd'jē, Australia, a large river of New South Wales, rising in the Gourock Range above Numeralla, about 40 miles from the Pacific Ocean. It flows at first northward, but the greater part of its course is westerly; and after receiving the Lachlan from the north, near Nap Nap, it turns toward the south to join the Murray below Balranald. It is navigable only in the wet season for 500 miles by light-draft steamers. Length about 1,300 miles.

MURSHIDABAD, moor-shē-dä-bäd', India, the administrative town of a district of Bengal, 116 miles north of Calcutta, on the Bhaghirathi, a branch of the Ganges. It is a straggling collection chiefly of mud houses occupying an extensive area, but has several substantial brick buildings, chief of which are the beautiful Nawab's palace dating from 1837, the imambara and a Moslem mosque. Two miles south of the city is Motijihl or Pearl Lake and the site of the historic palace of Suraj-ud-Dowlah. On the opposite bank of the river connected by a ferry is Azimaganj containing the old cemetery of the Nawabs, a mausoleum, mosque, etc. The city is noted for its ivory carving, its embroidery in gold and silver lace, silk weaving, and the manufacture of hookah pipes and musical instruments. It is still a busy centre of trade but less so than during the 18th century when it was the capital of Bengal and a very populous city, the rise of Calcutta causing its decline. Pop. about 16,000; with Azimganj 30,000.

MUSA, Ibn Nusair, moo'sạ ĭb'n noo-sir', Arabian general: b. 640 A.D.; d. 716 or 717. He became (704) governor of North Africa which he conquered in its entirety as far as the ocean between 706–709. He sent (711) Tarik to Spain but the expedition was so successful he became jealous of his assistant officers and hindered the expedition while he started himself (712) with an army which carried everything before it. He was recalled and had a most brilliant triumphal procession through Africa to Damascus, where the caliph, Suleiman, accused him of great embezzlements, deprived him of his command, and he was either condemned to pay a heavy money indemnity, or, as other writers say, was put to death. Consult Burke, 'History of Spain' (Vol. I, 1895); 'Cambridge Medieval History' (Vol. II, New York 1913).

MUSACEÆ, the banana family, a group in the Order *Scitamineæ*, comprising the largest of herbaceous plants, generally destitute or almost destitute of true stems, yet resembling trees in appearance, and sometimes rivaling palms in stateliness, the long sheating bases of the leafstalks combining to form a false stem. The blade of the leaf has many fine parallel veins proceeding from the mid-rib to the margin. The flowers are congregated on spadices, which are protected by spathes. The fruit is either a three-valved capsule or fleshy. The species are not numerous; they are natives of warm climates, in which they are widely distributed, and are of great value to the inhabitants of tropical countries; the fruit of some, particularly of the genus *Musa*, being much used for food, while the fibres of the leaves are employed for cordage and for textile purposes. See Banana; Fibre.

MUSÆUS, mū-sē'ŭs, in Greek mythology, a poet, seer and priest, said to have been the son of Eumolpus and Selene, or, according to others, the son and pupil of Orpheus. He was the reputed author of a number of poems, oracles, purificatory verses, hymns, etc., of which we possess but a few fragments, and those of doubtful authenticity. A later Musæus, who flourished about the end of the 5th century A.D., was the author of a beautiful little poem in Greek, entitled 'Hero and Leander.' See Hero; Hero and Leander.

MUSCARDINE. The common European dormouse (q.v.).

MUSCARINE, a coal tar color introduced by Durand and Hugenin, and having the empirical formula $C_{18}H_{15}N_2O_2Cl$. It is a brownish violet powder, slightly soluble in cold water, but dissolving readily in hot water with the formation of a violet-blue solution. Powdered zinc decolorizes its aqueous solution, but the color returns on exposure to air. Muscarine produces a blue color upon cotton that has been mordanted with tannin and tartar emetic.

MUSCARINE, an alkaloid having the chemical formula $C_5H_{15}NO_3$, and occurring in certain mushrooms, notably in the «fly agaric» (*Agaricus muscarius*). It is also formed in the putrefactive decay of flesh. It may be obtained in the form of deliquescent crystals which are without taste, and insoluble in ether, though readily soluble in water and in alcohol. Solutions of the alkaloid are strongly alkaline, and precipitate ferric and cupric salts in the form of hydrates. Muscarine is exceedingly poisonous. It contracts the pupil of the eye, slows the pulse by prolonging the diastolic state of the heart, and induces salivation, vomiting, intestinal spasms and general muscular weakness, followed by death. Atropine acts as an antidote to muscarine by producing antagonistic physiological processes. The «fly agaric» takes its name from the fact that flies that alight upon it are killed, either by the muscarine or by another alkaloid, neurine, which the fungus also contains.

MUSCAT, mŭs-kăt', **MUSKAT,** or **MASKAT,** Arabia, the capital of Oman, on the Gulf of Oman, commanding the entrance to the Persian Gulf. It is a fortified seaport of considerable commercial and strategical importance; the seat of the Imam or Sultan of Muscat; by arrangement it has a British political resident and since 1898 is used as a coaling station by France. Its appearance by no means corresponds with its wealth and importance. Large buildings are few, and the sultan's palace (a plain edifice), the governor's house, and a few minarets, alone rise above the mass of flat-roofed huts or houses. The streets are extremely narrow and its situation at the foot of high cliffs, and nearly surrounded by bare rocks, renders it one of the hottest places in the world. A sufficient supply of water is obtained from wells about 40 feet deep. About three miles distant is the town of Matrah with docks for building and repairing shipping. As it stands in an open plain, exposed to the sea-breeze, it is cooler than Muscat, so that many of the wealthier merchants of the latter place have their dwellings at Matrah, and spend only the hours of business in the neighboring city. The combined population of Muscat, Matrah and intervening villages has been variously estimated at 25,000 and at 60,000.

Muscat was occupied by the Portuguese under Albuquerque in 1507. In 1651 it fell again under a Mohammedan ruler. In the latter half of the 18th century it attained, under a ruler who bore the religious title of Imam, considerable importance as a seaport. In 1808 Seid Saïd succeeded to the sovereignty, having assassinated his cousin, Bedr. His sovereignty embraced also a stretch on the east coast of Africa, extending from the neighborhood of Cape Delgado northward as far as the equator. In like manner a large portion of the coast of the Persian Gulf acknowledged his sway, so that, including Oman and the African islands Zanzibar, Monfia or Mafia, and Pemba, the coasts ruled by him, for the most part only commercially, could not have had an extent of less than 3,000 miles. In 1840 Seid Saïd removed the court and seat of government from Muscat to Zanzibar, and in 1856 died on the return voyage from the former place. His son Mejed succeeded him as Sultan of Zanzibar and ruler of the African territory, and another son acquired Muscat. Seyyid Turki became ruler of Muscat in 1871, and on his death in 1888 a son succeeded him.

MUSCATEL, a name given to certain sweet and strong French and Italian wines, white or red. The white Riveralt and red Bagnol wines from Roussilon, the Carigliano and Lacryma Christi of Naples, and the Lunel from the Pyrenees are among the most famous.

MUSCATINE, mŭs-kạ-tēn, Iowa, city, county-seat of Muscatine County, on the Mississippi River, and on the Iowa Central, the Chicago, Rock Island and Pacific and the Chicago, Milwaukee and Saint Paul railroads, about 30 miles below Davenport and 140 miles east by south of Des Moines. It is at a bend in the river where the waters change from a westward to a southward current. As usual along the west bank of the Mississippi, the city is on high bluffs which command an extended view of the river. It was first settled in 1833, and in 1839 was incorporated. It is situated in a fertile agricultural region in which there is considerable wood land. Muscatine Island, just below the city, is noted for its watermelons. The chief industries of the city are connected with the manufacturing of foundry and machine-shop products, oatmeal, flour, pickles, brick, tile, boxes, canneries, buttons, sheet-iron, boilers, engines, packing cases, wagons, carriages, pottery, rolling-mill products, canned goods, lead works and lumber. It has considerable trade in its manufactured articles, farm and dairy products, hogs, lumber and fruit. Muscantine has good public and parish schools and several private schools. It has the public Musser Library. It has also several charitable institutions. The government is vested in a mayor, who holds office two years, and a council. The school board, police judge, treasurer, assessor and wharfmaster are chosen at a popular election by the people. The waterworks are owned and operated by the city. Pop. (1920) 16,068. Consult Richman, I. B. (ed.), ‘History of Muscatine County’ (2 vols., Chicago 1911).

MUSCHELKALK, mu̇sh'ĕl-kălk, a German name, signifying shell lime, applied to geological beds of middle Triassic or New Red Sandstone period, occurring in the Alps, in northwestern Germany, Alsace and Lorraine, Swabia, Franconia, Hesse, Thuringia and upper Silesia. The name is due to the many fossil remains of Cephalopods, Encrinites and Mollusca in general found in the limestone mass of these beds. The Muschelkalk is divided into lower, middle and upper. The beds contain valuable minerals such as salt, marl and gypsum.

MUSCIDÆ, mŭs-cĭ'dī, family of flies from the Latin *musca,* a fly. The most familiar examples are the house-fly and the blow-fly. They belong to the order diptera and their wings have the characteristics of the family, being naked, furnished with a single pair; the proboscis is used for sucking, ending in two fleshy lobes. The flagellum of the antennæ is generally plumed with hairs on both sides (the tsetse, however, on one side only). Upper surface of thorax has a transverse suture and the feet have a pair of adhesive pads. Their presence is almost universal, as they thrive in the cold northern latitudes as well as in tropical climes. The eggs are laid and hatched in filth. The species reaches a large and varied assortment.

MUSCLE-READING, a form of observation whereby one who is specially trained may, by careful study of muscular movements, interpret many wishes that are present in others. This is possible because all wishes, to be expressed, primarily involve muscular or glandular activity. Even though the wish, when conscious, is repressed, muscular reactions registering such repressions are always present and can be detected by a keen and practised observer. Thus a person who is told to think steadily, bearing in mind a certain number, unconsciously says that number over and over to himself, making thereby very minute muscular formations of the lips and muscles of the face. These can be seen and read by a skilled person, and thus is explained the common trick of many so-called clairvoyants. This tendency of motor expression of mental images is very pronounced in some people. They involuntarily go toward or away from a hidden object, and a blindfold person can often find these objects by carefully noting the degree of muscular resistance or acquiescence in their search for such objects. This parlor trick takes much practice, a quick sense and much concentration, but does not involve any «thought-transference,» or «mind-reading.» Some people become very skilful in this type of observation, and all may acquire a certain amount of skill by careful watching. Much of the so-called intuition of women is in reality muscle-reading. They are on the lookout for certain forms of muscular reaction, and can thus guess at what is going on in the minds of others. Their constant contact with small children, who characteristically show what they are thinking about, through their muscles of expression, is a school of experience for them. Man oozes his secrets at his finger tips. The popular song which says «Every little movement has a meaning of its own» contains more truth than fiction. (See Emotion). Consult Jastrow, *American Journal of Psychology* (Vol. IV, p. 398); Preyer, ‘Die Erklärung des Gedankenlesens’ (1886), and ‘Fact and Fancy in Psychology’ (1900); Kempf, ‘Autonomic Functions of the Personality’ (1919); Freud, ‘Psychopathology of Every-Day Life.’

MUSCLE-SENSATION, a loose and vague phrase, otherwise muscle-sense, to express the sum of sensations that come from the joints, skin, muscles and tendons in the act of making muscular movements. It is also applied to a generalized dull sensation which results from the stimulation of a muscle, either from electrical discharge or from fatigue following the long-continued stimulation of either a voluntary or involuntary muscle. The perceptions of muscular sense are usually grouped under (1) those of posture, the sensations occurring while standing, sitting or maintaining some unusual position being characteristic and recognizably different for each relative position of limbs; (2) those of the passive movement, in which a limb is moved by another person; (3) those of the active movement; (4) those of resistance to movement. The case of passive muscular sense is not to be confused with that of the so-called static sense, which is a sensation of change of direction, which one gets while being transported through space, or turned or inverted, and is mediated through the semi-circular canals of the ear. The muscle-sense is of much importance in imparting information concerning the relative position of the different members of the body, and its loss in this particular (asterognosis) constitutes a valuable symptom in the diagnosis of certain nerve disorders. The muscle-sense is all-important in maintaining bodily equilibrium. Each joint in the body possesses a varying degree of delicacy in this function of equilibrium. Thus the shoulder-joint is considered to be 40 times as delicate in this respect as the joints of the fingers. Angle of bending and speed of movement are both important in the interpretation of these joint-sensations. Muscle-sense in all its bearings has close relations to accuracy and skill in all limb-movements, as seen in musical performances, marksmanship, ball-playing, billiards, golf, etc., in all sports and games requiring delicate muscular adaptations. The muscle-sensations may become a seat of a great deal of autoerotic pleasure, even exclusive of merely genital masturbation, as may be seen in certain forms of dancing. In persons who take an undue interest in athletics there is frequently in addition to the exhibitionistic motive a large factor of gratification of the lebido (q.v.) through merely muscular contractions, the development of muscular strength feeding the unconscious desire for power and superiority in a sphere which frequently excludes real social aims. Consult Henri, ‹Année Psychologique› (Vol. V, 1899, with full bibliography); Baldwin, ‹Dictionary of Philosophy and Psychology›; Schäfer, ‹Physiology› (1900); Kempf, ‹The Autonomic System and the Personality› (New York 1919).

MUSCLES. The organs called muscles are made up of a collection of muscle-cells, which have for their function the accomplishment of bodily movements. These movements may be gross, as in walking, or very minute, such as take place in the contracting movements of the arteries or veins; they may be voluntary, brought into action by wishes and called «willed» impulses made possible by the brain structures, or they may be involuntary and brought about by acting through the vegetative nervous system (q.v.). The muscular movements necessary in writing are illustrative of the voluntary type; the heart-beat, of the involuntary variety. In point of evolutionary development the involuntary movements may be said to have preceded the voluntary, and hence in regard to complexity of structure the involuntary muscle-cells are simpler than the muscle-cells that perform voluntary movements, and to these two types of cells students of minute anatomy have given the names of unstriped or involuntary muscle, and striped or voluntary muscle. The muscular tissue of the heart is of intermediary character. It is a striped involuntary muscle. Muscle-tissue, like protoplasm, is strongly contractile, but unlike ordinary protoplasm, which can contract in all directions, muscle-substance can contract in only one direction. The simplest type of muscle-substance is seen in many lower animals. In these the muscle-cells are elongated spindles with sharpened points and with a single elliptical to rod-shaped nucleus, situated about the middle of the fibre. They show a faint longitudinal striation, vary in length from 40 to 500 microns (1-600, 1-50 of an inch) in length, and 3 to 8 microns (1-8000, 1-3000 inch) in diameter. These muscle-cells in man correspond to the unstriped muscle-cells, are bound together in bundles or flattened plates by an inter-cellular cement-substance and are found more particularly in the walls of the intestine, the trachea, bronchi, blood-vessels, bladder, ureter, uterus, in many of the organs of the body, and in glandular structures. They have a rich blood-supply and a nervous network of sensory terminal filaments, as well as fibres from the vegetative (old term was sympathetic) nervous system. The pains of an intestinal colic, of a gall-stone, of childbirth, are all due to forcible contractions of these involuntary muscle-cells in the respective organs. The more prominent muscles of the body, such as those that move the various bones, the muscles proper and such as are eaten as roast beef are of the striped variety. These are a modification of the simple spindle-cells. In man they originate in the mesoderm, muscle-substance commences to form in the interior of some of the cells; these elongate, many nuclei are formed and the final result is a bundle of much elongated cylindrical cells 12 centimeters (2 inches) long and from 10 to 100 microns (1-2500 to 1-250 inch) broad. Each cell is covered by a special sheath, the sarcolemma, and within is made up of very intricate and minutely structured protoplasm, the most striking feature of which is its banded or striated appearance; hence the name striated. Just within the sarcolemma a number of flattened elliptical muscle-nuclei are found. In insects striped muscle-tissue can be studied to best advantage. Occasionally branched forms of striated muscle are found. Blood-vessels are numerous in striped muscle and lymphatics and nerves are also abundant. Special types of nerve-endings and muscle-plates, are characteristic of voluntary muscle. Striped muscle is probably a combination of types of muscle. The sarcoplastic substance is thought of as of unstriped muscular origin, and it is probably innervated by the vegetative nervous system. This type of innervation is that which keeps its metabolism in order, and also contributes to what is known as muscle-tonus. The emotions act through this part of the muscle probably. The other part of the muscle, called the anisotropic disc, is probably innervated by the sensori-motor system and is that part of the muscle which carries out willed or wished actions.

Heart-muscle differs from ordinary striped muscle by having shorter oblong cells, which are branched. There is no sarcodemma and the cells contain but one or two nuclei, which are situated in the centre of the muscle-substance. Blood-vessels, lymphatics and nerves are plentiful in the heart-muscle.

Groups of these muscle-cells, with connective tissues, tendons and fat, make up the gross muscles of the human body. The voluntary muscles are all attached to bony structures; the involuntary muscles are found in the softer parts. Contraction and expansion are the expressions of their functions, each set of muscles being provided with antagonists, and it is characteristic that in response to pleasure-giving stimuli movements of expansion result, whereas under painful stimuli contraction is marked. Modern psychological theories have been founded on this fundamental principle, emotional states being interpreted as being founded on visceral muscular activities. The forms of external stimuli that can cause muscular action are usually classed as mechanical, chemical, thermal and electrical. Excess of stimulus brings about a condition of fatigue in muscle. This is accompanied by diminished muscular power, by pain or discomfort, by diminished reflex excitability and by vague symptoms in the body indicative of some perversion of metabolism.

Muscles are classified in various ways, according to structure or according to their function, or by their positions and situations in the body. For example, some muscles are attached to bones, which they move after the fashion of levers. Such muscles are said to arise or take origin from definite points of bones and are generally inserted into bones by tendinous prolongation of the muscular substance. The insertion is the moving point, and the origin the fixed point of the muscle. The tendons of muscles vary in length and breadth. They represent inelastic bands of fibrous tissue, the fibres of which insensibly merge into and become continuous with their attached muscular fibres. When the tendinous fibres of muscles become greatly broadened out, so as to form fibrous webs or membranes, which separate or enclose muscles, or which afford extensive surfaces for their attachments, the term aponeuroses is then applied to them. Such aponeurotic expansions are seen in the terminations of the muscles of the abdominal wall, in the scalp and in other situations. The limit or extent of the action of a muscle is determined by the length of its fibres, whilst its degree of force or strength depends on the number of the fibres. Other muscles are not attached to bones as levers, but on the contrary surround and enclose cavities, which they limit or expand as required. Such hollow muscles are exemplified in the heart and uterus, in the muscular fibres of blood-vessels, in the muscles of the digestive tract, in the iris of the eye, etc.

The nature, mode and effects of muscular action may be briefly considered in connection with the present subject. The muscles which have the most active functions are those most abundantly nourished. Every action on the part of a living being results in the production of a certain amount of waste material, evinced by perceptible differences in the chemical composition of the tissue. And when it is remembered that the nervous and vascular supply of muscle is also concerned in muscular work and waste, the entire question is seen to assume aspects of a very intricate and complicated nature. Increased exercise of muscles — as seen in gymnastic exercises, or in the exercise of certain trades (for example, the arms of the blacksmith and the lower limbs of the ballet-dancer) — demanding increased nutrition, results in the increased growth of the muscle and in the formation of new tissue. This result, it is evident, can take place only when the nutrition of the tissue keeps pace with or slightly outstrips its waste and wear.

The property of contractility distinctive of muscular tissue, and through which its functions are manifested, is generally, though not always or invariably, brought into action through the stimulus of the nervous system, or more widely speaking, through stimuli conveyed to the muscular fibres through the nerves. The subject of the various kinds of muscular actions involves both physiological and mechanical considerations. The voluntary muscles thus constitute moving powers for the bones as levers; and in the living body examples of the three kinds of levers which mechanical science distinguishes are found. In the familiar action of the biceps muscle, which flexes or bends the fore upon the upper arm, is seen an instance of a lever of the third kind, in which the power (represented by the insertion of the muscle on the radius or bone of the fore-arm) is placed between the fulcrum (at the elbow-joint) and the weight (in the hand). The lever of the second order may be illustrated by the raising of the body upon the toes, as in the act of making a step forward in walking. Here the weight (represented by the body pressing on the ankle) is placed between the fulcrum (formed by the fixed toes) and the power represented by the muscles of the calf. The head moving on the spine illustrates a lever of the first order; the fulcrum being represented by the atlas vertebræ, the power by the muscles of the neck and the weight by the heavier portion of the skull situated in front of the spine. See ANATOMY.

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MUSCLES, Diseases of. Very little is known of the diseases of muscles themselves. Muscle-tissue, in common with other types of tissue, undergoes certain forms of degeneration, fatty, mucoid, gelatinous, calcareous, etc., but of the diseases of the muscular tissues themselves there are few well-defined types. The reason for this lack of definite information bearing on diseases of the muscles is largely due to the close relationship that the nervous system bears to the muscular system. This renders it almost impossible to distinguish between a disease of the muscle and a disease of the nerve structures which are distributed to that muscle. Thus, at the present time, it is held that many of the forms of muscular atrophy and some of the forms of muscular dystrophy are forms of the diseases of the nervous mechanism of the muscle rather than disease of the muscle itself. In former times these were classed as diseases of muscle.

Myositis, simple inflammation of the voluntary muscles, is a form of acute or subacute inflammation in the muscle, due probably to some infectious organism. It is characterized by stiffness of the muscles and with swelling in the muscle-substance. It is usually progressive, the muscles of the body becoming stiff, hard and fragile, and undergoing fatty degeneration. Myositis is probably a very rare affection, and it is not yet known whether it is a primary or a secondary condition. Ordinary muscular spasms or muscular cramps are in reality localized neuralgias in the muscle, and should be considered as of nervous rather than muscular origin. Lumbago is one of the conspicuous examples of a neuromuscular affection. It is probably located in the sarcoplasm of the muscle, and results from disturbance of the vegetative nervous system control of the muscle. It may be a result of emotional upsets.

or follow undue exercise. Myoclonia or Friedrich's disease, and myotonia, or Thomsen's disease, are two forms of disease affecting the muscular system that have certain superficial resemblances to hysterical affections, and although regarded by many as of purely muscular origin, there are many reasons for believing that these diseases are of the neuromuscular type. In myotonia the disease usually comes on in childhood; the muscles become stiff, and the children are noted for being clumsy in their movements. The contractions, as in the hand, for instance, commence very slowly and are performed almost automatically, and when the patient desires to loosen his grasp of an object the muscular response is slow, the contraction often persists or the patient may be scarcely able to open his hand. In much the same manner walking is affected; the patient starts with difficulty; one leg seems to be stiff and halts; but after a few moments of limbering up, as it were, the patient may be able to walk more or less briskly. The disease is chronic, and is probably related to a defect in the vegetative reflex arc mechanisms acting chiefly through the sarcoplastic elements. It may be emotional but is probably related to faulty muscle metabolism of endocrinous bases.

Myoclonia occurs chiefly in patients of bad nervous condition, and consists in clonic contractions of the muscles of the extremities. These contractions somewhat resemble chorea. Associated muscle-groups seem to be involved in myoclonia, whereas in chorea the contractions are extremely irregular. The disease is probably most closely associated with the convulsive tics and is probably due to some affection of the motor cortex. Treatment is difficult but the psychogenic element may be reached by psychoanalysis.

Myositis ossificans is a very rare chronic affection of muscles, during which the muscles become harder and harder, and finally develop bone-like transformations, so that the patient becomes like the ossified man of the circus. As a matter of fact most of these cases drift into museums and circuses. Very little is known as to the cause of the disease, and treatment is unavailing. Consult Jelliffe and White, 'Diseases of the Nervous System' (3d ed., 1919).

MUSCOGEE, Okla. See MUSKOGEE.

MUSCOVITE, or **COMMON MICA,** a native silicate of aluminum, potassium and hydrogen, occurring in crystals that belong to the monoclinic system, though usually hexagonal or rhombic in general form, and distinguished by the facility with which it may be split into thin laminæ. Muscovite also occurs in massive forms and in scaly aggregates. It occurs in various colors, and has a lustre that is vitreous or pearly. It is transparent or translucent, with a hardness of from 2 to 3, and a specific gravity of from 2.8 to 3. It is a very common mineral and is an essential constituent of granite, gneiss and numerous other rocks. The transparent varieties, when obtainable in considerable size, are used for the manufacture of gas-burners chimneys, for covering the windows of stoves and the «peepholes» of furnaces, and for other purposes where transparency must be combined with infusibility and with a considerable power of resisting the prolonged action of heat. Considerable quantities of it are mined in Bengal and in Switzerland, and fine deposits occur in many parts of the United States. Perfectly transparent plates a yard in diameter are sometimes found at Grafton, N. H., and similar specimens also occur in the western part of North Carolina. Pulverized muscovite is employed in the preparation of certain kinds of paint and in the manufacture of insulating material for use about electric machinery. Muscovite is not affected by acids, but decomposes upon being fused with the alkaline carbonates. The name «muscovite» is derived from the older popular name «muscovy-glass,» which is supposed to refer to the fact that the Russians used it for window-panes. See MICA.

MUSCOVY DUCK, or **MUSK-DUCK.** See DUCK.

MUSCULAR SYSTEM, Development of. Two main forms of muscle-tissue (see MUSCLES) exist in the human body, the striated muscle-tissue, which makes up the muscles of the bony framework of the body, and which responds to willed or wished impulses passing through the brain structures, and also to vegetative stimuli of the unstriated muscle-tissue, which chiefly responds to automatic stimuli of unconscious nature by means of the vegetative or sympathetic nervous system. Some control of vegetative functions may be exercised by conscious processes. (See NERVOUS SYSTEM). The heart-muscle is regarded as an intermediate form, resembling striated muscle-tissue, but in its development more nearly allied to the more primitive unstriated muscle-tissue. Non-striated muscle-tissue is formed by a direct transition of certain cells in the middle germinal layers (see EMBRYOLOGY) or mesenchyme. At first these muscle-fibres are irregularly distributed, but later they are collected into small bundles or into layers, and become associated with the individual organs with which they functionate. Striped muscular tissue develops from the same layer, but the details of development, as is the case in the histogenesis of the heart-muscle, are extremely complicated. The cells at first develop a mesh-like structure or reticulum. This reticulum develops small discs, which later become small columns of muscular tissue. The columns at first develop at the periphery of the cell, and gradually fill in around the nucleus, which in the heart-muscle lies in the centre of the cell, whereas in the muscles of the skeleton the nucleus is pushed to one side, or disappears, new nuclei appearing just beneath the sarcolemma-sheath. The skeletal muscles develop in regular order from the different segments (somites) of the mesoderm. In the early stages the distribution is very symmetrical, but later it becomes extremely uniform by reason of the irregular welding of different segments of the bony skeleton. There remains, however, a regular association of the muscular myotomes and their embryonic nerve supply, and the homologies of structure may be traced by the nerve-supply, although the muscles themselves may have shifted from their original position. This is a question of highly technical nature, but has many practical bearings in modern medicine. Thus the great broad muscle of the back, the latissimus dorsi, which arises from the seventh and eighth cervical segments, but later migrates and is fastened all the way down the spine as far as the crest of the hip-bone, is supplied by a nerve which also develops from the seventh and eighth cervical nerves. The development history of each skeletal muscle can thus be traced by means of its nerve-supply. The whole process is one of extreme intricacy and should be studied in special monographs.

Evolution of Muscular Tissue.—As in the development of the muscular system in man there has been a gradual evolution of the plan of muscular arrangement, so in the animal series there has been a gradual development of a muscular system from the very simplest types of contractile protoplasm. Even in plants definite movements may occur which may be very slow or very rapid. Yet no muscular tissue proper has ever been found in plants. Many of the lowest plants, the *Algæ*, are motile and are provided with vibratory cilia, but these minute hairs, although capable of rapid motion, cannot be regarded as muscular organs. In the contracting protoplasm of the lowest animals, the rhizopods, although movements take place, there is no muscle-tissue. Nor is muscle-tissue found in the next higher group, the *Infusoria*, although very actively moving forms are known, for example, the familiar microscopic animal *Paramœcium*. The bell-animalcules, *Vorticella, Stentor,* etc., have stalks that coil and uncoil with great rapidity, but they contain no muscle-tissue proper. They do, however, contain what are termed myronemes, and spironemes, which are longitudinally striated and have as many functionate as muscular organs. In another genus of infusorians (*Bursaria*) there is a contractile band about the body of the animal. It has been regarded as a true sphincter muscle. It has not the structure of the developed unstriped muscle-cell. In the closely allied sponges (*Porifera*) certain elongated cells with rod-shaped nuclei are found, and may be considered the ancestral forms of the unstriped muscle-cell, although it is not until the group of the *Cœlenterates* is reached that true unstriped muscular tissue is present in its more advanced forms. In many of the hydroids a form of external neuromuscular cell is found. This is a type of cell half nerve, half muscle, but not resembling true muscular tissue. In the jellyfishes of this order both neuromuscular tissue and true unstriped muscle-fibres are found. In the sea-anemones unstriped muscle is abundant. It is mostly developed, however, from the external layers of the body, and thus embryologically is not comparable to the muscle-tissue that in practically all the animals higher than the cœlenterates is formed in the middle germinal layers of the developing animal. In one of the higher cœlenterates, the common water-hydra, some muscle-cells are found imbedded in the deeper tissues of the body, thus foreshadowing the higher type of muscular tissue. In the next great family of animals, the *Echinodermata,* to which the sea-urchins, starfishes, and sea-cucumbers belong, unstriped muscular tissue is common, but no evidence of striated or striped muscle is yet present. In the worms the muscular tissue is unstriped and abundant. In the mollusks, the foot of the soft clam, the muscle of the oyster, are made up of unstriped muscle fibres. A higher order, the *Arthropods* or *Crustaceans,* including the crabs, lobsters, etc., contains a well-developed muscular system, which is made up of striated muscle, practically the first appearance of this type of muscle in the animal kingdom. In these animals, moreover, there is a type of development of the muscles that anticipates the regular segmented type, metameres or myomeres, of higher animals.

From the crustaceans onward both types of muscle-tissue are found. In the low vertebrates, *selachians* and *fishes,* typical heart-muscle cells, striated and with central-lying nuclei, are found. Consult McMurrich, ‘Development of the Human Body,’ with full bibliography (1902); Parker, ‘The Elementary Nervous System’ (1919); Bayliss, ‘General Physiology.’ See Anatomy.

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MUSCULUS, Wolfgang, German scholar and Protestant theologian: b. Dieuze, Lorraine, 1497; d. Bern, 30 Aug. 1563. He entered the Benedictine Abbey of Lutzelstein and was ordained priest. He was converted to the Protestant faith by Luther's writings, withdrew from his order in 1527 and in 1531 became pastor of a church at Augsburg. In 1536 he assisted at the Wittenberg assembly, and in 1540 was appointed by the Augsburg senatus a delegate to the ecclesiastical conferences at Worms and Ratisbon. He subsequently became professor of theology at Bern. Among his works are ‘Commentarii in Genesin’ (1557); and an edition of Polybius.

MUSES, goddesses of the liberal arts and sciences; originally nymphs of inspiring fountains. Different accounts are given of their origin. There is also a great difference in their names and attributes. The most celebrated are the daughters of Zeus and Mnemosyne. According to Homer they lived upon Olympus. At first three Muses only were known: Meletē (meditation), Mnēmē (memory, for the immortalizing of great deeds), and Aoidē (song, for the accompaniment of story). Four Muses are sometimes mentioned as the daughters of Zeus and Plusia, namely, Meletē, Aoidē, Archē and Thelxinoē. At other times they are said to have been seven, at others eight in number. Nine Muses are also enumerated as the daughters of Pierus, king of Emathia; but these are usually held to be different from the nine Muses who ultimately came to be generally recognized in Greece; and although the genuine Muses are sometimes called Pieridæ, they are said to have derived the epithet not from Pierus but the district of Pieria. The names finally recognized as those of the Muses were Clio, Euterpe, Thalia, Melpomene, Terpsichore, Erato, Polyhymnia, Urania and Calliope. Among the adventures of the Muses their three contests with the Sirens, with the daughters of Pierus and with the bard Thamyris, in all of which they were victorious, are particularly famous. The customary occupation of the Muses was singing and dancing. Separate attributes were not till a comparatively late period assigned to the individual Muses. Calliope became the Muse of epic poetry. She was the most distinguished among the Muses, the protectress of kings, whom she endowed with eloquence and song.

Clio became the Muse of history; Euterpe of lyric poetry and music, particularly of wind-instruments; Thalia of comedy; Melpomene of tragedy; Urania of astronomy; Erato of lyric and erotic poetry; Polyhymnia of the sublime hymn; and Terpsichore of the dance. They are commonly represented as beautiful virgins, adorned with wreaths of palm leaves, laurel, roses or the feathers of the Sirens. They dance in a circle, together with Apollo, who in later times was styled Musagētēs, or leader of the Muses. Their worship extended from Greece to Italy. In Rome they had a separate temple, and a grove was sacred to them. The swan, the nightingale and the grasshopper were also sacred to them.

MUSEUM OF ART, Metropolitan. See Art, Metropolitan Museum of.

MUSEUMS are institutions for the preservation, study and display of natural objects, or of those made by man, while as a sequence of study comes the publication of information thus derived. The word museum originally signified merely a grove or other locality sacred to the Muses, but with the development of the museum the word has undergone a parallel course of evolution until it has come to have its present meaning. The next use of the term was for an institution devoted to the study of philosophy, literature and art, but not including the preservation and display of objects; in this sense it was applied to the famous Museum of Ptolemy Soter at Alexandria. While this was in the nature of a university, there is some reason to believe that collections of plants and animals were attached to the institution so that it may be regarded as the prototype of the more modern botanical and zoological garden. In modern sense public museums are of comparatively recent establishment, and as educational factors, of later date than art galleries and libraries, although like these having their beginnings in the gratification of the desires of private individuals. The origin of the art museum is to be found in the collections of statuary, paintings and other works of art, made by kings, nobles and men of wealth; the germs of the modern museum of natural history were the cabinets of miscellaneous curiosities brought together by students, merchants, or men of leisure. Many of these collections subsequently developed into important public museums, the most striking example, and the one most frequently cited, being the British Museum (q.v.), which was the final outgrowth of the cabinet and library of Sir Hans Sloane. In the United States the Museum of Comparative Zoology, at Cambridge, Mass., has grown from the collection made by Louis Agassiz (q.v.) for his own use, until it has become one of the most important museums in this country. Even the United States National Museum, if not the direct outgrowth of a private collection, was indirectly due to the labors of individuals, for its nucleus is to be found in the specimens gathered by the National Institution (later the National Institute), a body organized with the avowed purpose of directing the bequest of James Smithson (q.v.) and engaging in pursuits in accordance with its terms.

The lineal successors of the cabinets of private collectors were the museums of scientific societies where specimens were gathered for purposes of study and display, and while these still exist they have largely given place to museums supported by the State or municipality. Private collections are more numerous than ever, but these are rarely formed with any intention of displaying their contents to the public, although there are some notable exceptions, as in the museum of the Hon. Walter Rothschild at Tring. Ultimately, however, a large proportion of these private collections find their way to public museums through the liberality of their owners, or by bequest.

Another step toward the establishment of public museums was the formation of collections of objects of more or less popular interest and their exhibition to the public on the payment of a fee. Notable examples of these abroad were those of Sir Ashton Lever and Charles Bullock, which flourished in London during the latter portion of the 18th century and first part of the 19th. It is interesting to note that one of the earliest cabinets formed in the United States, that of Mr. Arnold, of Norwalk, Conn., was sold to Sir Ashton Lever, while later on the «Leverian Museum» was sold and its specimens scattered among the great museums of Europe.

Early American Museums.—In this country the principal recent museums of this character were the Boston Museum and Barnum's Museum in New York, in both of which the idea of amusement predominated, the first named being a rather incongruous introduction to a theatre. Both, however, contained some really valuable specimens of natural history and Barnum was among the first to exhibit living fishes. Of a very much earlier date and more scientific in their aims were the museums conducted by Charles Willson Peale and his son, Rembrandt Peale, in Philadelphia, established in 1785 as the Philadelphia Museum, and from 1822 to 1828 installed in Independence Hall. This museum is of particular interest from the fact that many of Peale's ideas as to the arrangement and educational value of museum collections were in advance of his time. In his use of painted backgrounds and the addition of nests and eggs to the exhibits of mounted birds we have the germ of the elaborate habitat groups shown in modern museums.

The modern «dime museum» with its exhibit of «freaks» is a survival of this phase of museum development, and the catalogues of some celebrated old collections will show that they comprised many very similar objects, as well as those of real value from a naturalist's standpoint.

Government Museums.— The final step in the establishment of public museums, the transferral of collections from private to governmental ownership, may be said to date from the founding of the British Museum in 1753. At first admission was by ticket and limited to 30 persons per day; in 1810 the museum was made accessible to the public for three days a week, and not until 1879 was it open to the public daily. The United States National Museum was only formally created in 1876, although so early as 1846 the government possessed collections which were in the custody of the Smithsonian Institution. Exploration has done so much for museums that it may almost be included among the causes that have led to their formation. The colonization of America brought to Europe many examples of new plants and animals, while the Dutch East India voyages did the same for southern Asia, and it is surprising to see how large a number of species from these regions was described by Linnæus and others so early as 1760.

In more recent times the Wilkes Exploring Expedition of 1838–42 and the government surveys for a route for the Pacific Railroad had a very decided influence on the origin and growth of the United States National Museum, and there is scarcely an institution that has not been benefited in a similar way. It is but a step from expeditions in which scientific results were subordinate to practical ends to those undertaken solely for scientific purposes, and the systematic exploration of our Western Territories for fossils by such institutions as the American Museum of Natural History and the Carnegie Museum, and by Yale, Princeton and other universities, has become a matter of almost daily news. Another most important factor in the development of museums has been national or international exhibitions. These have had a direct effect in bringing together collections illustrative of natural or industrial resources, and a more indirect influence in stimulating methods of arranging and displaying such material. The London Exhibition of 1851 led to the establishment of the South Kensington (now Victoria and Albert) Museum, and the ethnological museum of the Trocadero was one of the outcomes of the Paris Exposition of 1889. Our own Centennial Exhibition was the direct cause of the erection of a building for the United States National Museum and of the founding of the Pennsylvania Museum of Art, while from the Chicago Exposition came the Field Columbian Museum, the Chicago Art Institute and the Philadelphia Commercial Museum. Other causes play minor parts in influencing the lines of growth of museums both small and great. Thus the extensive colonial possessions of Great Britain have been largely instrumental in making the vertebrate collections of the British Museum, the greatest in the world, while the museum at Leyden is not far behind owing to the former extensive commerce of Holland. In the United States the large deposits of fossil vertebrates in the West, their general accessibility, the imposing appearance of many of the specimens and the important results to be derived from their study have given a great impetus to the formation of palæontological collections, while special attention has been given to the preparation and exhibition of this class of material. The display of fossil vertebrates in the American Museum of Natural History is unrivaled, and other notable exhibits are to be found in the Museum of Yale University, and in the Carnegie, Field and United States National museums. The National Gallery of Art and the Freer Collection, installed in a building of its own, both forming parts of the United States National Museum, were respectively the gifts of William T. Evans and Charles L. Freer.

Popular Display of Specimens.—What may be termed the popularizing of museums has but recently taken place, and while the display of objects has always been regarded as one of the functions of museums, it is a branch which has received particular attention only during the past 30 years. Originally the larger part of the specimens of birds and mammals were placed on exhibition, but it became evident that this meant the injury or even loss of many, and that the public cared little for large monotonous series of stuffed animals. At present the number of objects on exhibition is relatively small compared with those in the reserve or study series, and there is a very general effort to display at least a part of the specimens amid their natural surroundings. The influence of the private collector has probably had much to do in bringing about this change, and the British Museum, under the administration of Dr. Günther, was the first of the great museums to introduce groups of birds, with their natural surroundings, as a part of its exhibition series. These were largely added to under the directorship of Sir William Flower, who took great interest in the problem of rendering museums attractive and instructive, while, following this example, the American Museum of Natural History took the lead in this direction in the United States. To the museum of Leyden, Holland, however, belongs the credit of having before this departed from the tradition that mammals must be stuffed in stiff and formal attitudes and caused some to be mounted that bore some resemblance of life. Change in the character of the exhibits has been accompanied by equal changes in the matter of labeling and to some extent in the publications issued by museums, so that from being merely storehouses of material for the benefit of a few they have become great schools of instruction for the many.

School Work of Museums.— In direct line with what may be termed passive educational work by means of carefully arranged and well-labeled exhibits is the active participation of museums in the work of public schools of all grades by means of circulating loan collections, the giving of lectures at museums or sending lecturers to the schools, and the loaning of series of lantern slides to illustrate such subjects as natural history, geography, history or technology, and in this connection motion pictures have been found most helpful.

The initiative in this line seems to have been taken by the Buffalo Academy of Sciences in 1872 and the Davenport Academy of Sciences in 1878, in both cases by means of lectures given at the museum. The Public Museum of Milwaukee appears to have been the first to loan definitely selected material; the American Museum of Natural History, under the administration of Professor Bickmore, the first to give systematic courses of lectures more or less correlated with school work. This latter institution was also the first to establish a department of public education (instruction) for the sole object of co-operating with the public schools.

Following in the lead of these institutions, or acting independently, many other museums have actively engaged in school work, notably the Commercial Museum of Philadelphia, Chicago Academy of Sciences and the Educational Museum of the Saint Louis public schools. This last, the first to be devoted exclusively to school work, though founded by the board of education in 1904 as an outcome of the exposition of that year, is a museum of distribution rather than of exhibition, its work being the loaning of specimens, charts, models and similar objects to the public schools.

Classification.— Museums may be grouped or classified by their contents, or according to the purposes for which they were established. Following the first method Dr. Goode has divided them into museums of art, history, anthropology, natural history, technology and commerce. A museum may be established for any of these great subjects as a whole or for one of the many branches in to which they may be subdivided. Thus a museum of natural history may comprehend both animals and plants, or one of the other of these primary divisions; it may include the animals of a single continent, a single geographical region or be restricted to those of one locality; it may be devoted to some large group, as mammals, birds or insects, to some minor division, as birds of prey, butterflies, etc., and may or may not include fossil species. Technology may be greatly subdivided, and while the favorite and more striking subjects are shipbuilding and railroads, there are also museums of hygiene and textile fabrics, while the United States National Museum contains collections illustrating the development of electrical apparatus. And technology may trespass on art in the matter of ornament, or, like art, be included in a historical collection illustrating the progress of mankind or of one nation.

According to the purposes for which they are founded Dr. Goode distinguishes national museums; local, provincial or city museums; college and school museums; professional or class museums; and museums or cabinets for special research owned by societies or individuals. This scheme of classification is open to the objection that it confuses purpose with ownership or administration, since, for example, national and municipal museums are not merely for the display of objects found within their boundaries, but for those belonging to the nation or city.

College and school museums have for their immediate purpose the formation of collections that shall aid students in understanding various problems connected with science, technology or art, but they are usually extended beyond this and become more or less general in their character. This has been the case with the museums of Harvard and Yale universities and is notably true of many foreign museums, such as that of the Royal University of Prussia, which is the national museum. The professional museum is for the illustration of some special occupation or line of research such as mining, medicine or even psychology, which has a museum at Florence founded by Mantegazza. The largest institution of this kind is the Museum of the Royal College of Surgeons, London, which has developed from the private collection of John Hunter.

The Army Medical Museum, Washington, had its inception during the Civil War as a museum of pathology and military surgery, but its scope has been so extended that it offers a fairly comprehensive history of the progress of medicine and surgery. The library established in connection with this museum has grown to be the first medical library in the world.

Modern European Museums.—Europe naturally has the greatest number of governmental museums, the capital of almost every state claiming at least one museum of natural history and an art gallery, and often anthropological and technological collections as well. Paris, with some 30 museums, probably leads in the matter of national collections, while Berlin and Vienna have respectively about 20 and 15 museums. Turkey forms a notable exception to the above statement, for Friedlander's Directory contains no mention of a Turkish museum, although a commercial museum has been established at Constantinople. Great Britain has the largest number of local museums, those devoted to the preservation and display of objects illustrating the natural history and archæology of the immediate vicinity, and, as a whole, these are better administered than those of other countries, great care being devoted to labeling, arranging and otherwise making the collections interesting and instructive to the public.

Europe in general and Germany in particular possess many technological museums devoted to the illustration of such subjects as mining, pottery making, weaving, shipbuilding, machine construction and operation and similar topics. Perhaps the most important of these is the Deutsche Museum of Munich, which among other exhibits has a considerable number of working models of such machines as locomotives, so constructed that a large number of the parts is visible, and may be set in motion by the visitor.

Modern American Museums.— There are now nearly 600 museums in the United States, about three-fourths of them attached to colleges or under the supervision of societies, but comparatively few of these are active or important. Nearly half of the whole number are entirely or chiefly devoted to natural history and about 10 per cent to art, though this proportion seems on the increase and the past decade has witnessed the establishment of several important museums of art. A considerable number of museums are general in their character, including both art and natural history.

About 25 per cent of our museums include or are devoted to history, but here again few are active, though there are noteworthy exceptions, such as the Essex Institute of Salem, Mass., and the Historical museums of Chicago and Buffalo, the latter of which makes a specialty of publication.

The United States is strangely poor in technological museums or even in extensive technological collections, though these are steadily on the increase. There is, for example, no museum of naval architecture in this country, the nearest approach to it being the collection of the United States National Museum, in which certain phases of the subject are well represented.

Our oldest existing museum, as well as the first public museum in America, is the Charleston (S. C.) Museum, founded by the Charles-Town Library Society in 1773, later incorporated in the College of Charleston and recently passing to municipal control, thereby taking on a new lease of life. Next to this is the Peabody Museum of Salem, the successor of the East India Marine Society Museum, founded in 1799; it also includes the natural history collections of the Essex Institute.

The Museum of Comparative Zoology, Harvard University, holds the first place among college museums. It is not confined to zoology, as its name might imply, but covers the entire field of natural history. The mineralogical collection dates back to 1793 and is probably the oldest of its kind in America, while the botanical section includes the Gray Herbarium. The nucleus of the Museum of Comparative Zoology was the private cabinet of Louis Agassiz, which was purchased by subscription for $12,000 in 1852. In 1858 an allowance was made for the maintenance of the museum and in 1859 the State of Massachusetts assumed an interest in the institution, at the same time appropriating $100,000 for its increase; $71,000 was also raised by private subscription. In 1876 the State assigned its rights to Harvard College and since that time the museum has been maintained by the university, although the great increase in its collection was principally due to the liberality of Alexander Agassiz, who expended over $1,000,000 for that purpose. An important museum of anatomy is attached to the Harvard Medical School. The Museum of Yale University contains the Marsh collection of fossil vertebrates, comprising many types, as well as the largest collection extant of fossil footprints, while brachiopods and sponges are well represented. In other departments are a fine series of modern corals and many rare archæological specimens. The Museum of Yale University is temporarily in storage and there is no immediate prospect of a new building — nevertheless the collections exist. The Museum of Princeton University possesses large and important collections of fossil mammals from Patagonia and our Western States, a good collection of North American birds and many examples of ancient and modern art. The Museum of Archæology, University of Pennsylvania, has the best collection of Babylonian antiquities in America and is also particularly strong in America archæology; also attached to the university is the Wistar Institute of Anatomy. To Amherst College belongs the Appleton Cabinet of fossil footprints, containing the specimens described by Prof. E. Hitchcock, and the University of Kansas is rich in Cretaceous vertebrates and large North American mammals. On the Pacific Coast Stanford University and the University of California both have museums; at present these are largely working collections, but both have art collections apart from these.

The most important as well as oldest museums under the control of scientific societies are those of the Academy of Natural Sciences, Philadelphia, and the Boston Society of Natural History; the first dating from 1812, the latter from 1831, although it was the successor of the Linnæan Society, founded in 1814. Each contains large collections of birds comprising many types of species described by our earlier ornithologists, such as Wilson, Bonaparte, Cassin and Lawrence. The academy has the largest collection of mollusks in America, and one of the largest in the world, including many types of Tryon, Say and Pilsbry. These two institutions may be looked upon as the predecessors of public, scientifically arranged museums in the United States, the majority of our museums being of very recent origin.

There are few museums in the United States directly owned or administered exclusively by municipalities, as are public libraries, almost the only one being the Public Museum of the city of Milwaukee, but there are many to which the city has contributed or does contribute, either by grants of land, erection of buildings or annual appropriations for financial support, and there is a growing tendency toward this co-operation between city and citizens as the educational value and practical importance of museums are recognized. About 15 per cent of our museums belong in this class, including many of the largest and most active, the chief among them being the American Museum of Natural History.

There is, however, a large and constantly growing number of State museums, that of New York standing first, while those of Ohio, Illinois and Pennsylvania are most important. The scope of these State institutions is somewhat general, comprising natural history and history, this latter being usually treated in a somewhat desultory way.

In the category of museums supported by endowment or by private funds and municipal aid are to be found all the art museums in the United States, not one having been established by the national government or that of any State. Local museums are practically lacking in the United States; for most of the smaller museums, even, make the attempt to cover the same ground as the larger institutions when they could achieve much better results by confining their attention to the immediate vicinity. In conclusion it may be said that while public museums are not so numerous in the United States as might be expected from the size, resources and wealth of the country, the last 25 years has not only witnessed a great increase in their number but in the growth and educational efficiency of those already established.

Bibliography.— For detailed information as to museums and their administration, cases, labels and the arrangement of exhibits, consult 'Museums Association, Report of Proceedings, etc.' (London 1890 to 1900); since that date 'Journal of the Museums Association' and 'Proceedings of the American Association of Museums' from 1907; the museums of the United States are listed in 'A Directory of American Museums,' published by the Buffalo Society of Natural History, 1910; those of Great Britain and her colonies in 'Directory of Museums in Great Britain and Ireland' London 1911). For the history of the Smithsonian Institution, United States National Museum, classification and administration of museums, consult 'A Memorial of George Brown Goode' (Report of the United States National Museum for 1897, Part 2, Washington, D. C.).

A work in three volumes on 'Museums, their History and their Use, with a Bibliography and List of Museums in the United Kingdom,' by Dr. D. Murray, has been published by James Maclehose & Sons, Glasgow.

The volume of museum literature in the shape of reports, bulletins, general guides and special leaflets is to-day very considerable and many museums issue regular periodicals for the information of their sustaining members and the public.

Frederic A. Lucas,
Director, American Museum of Natural History.

MUSGRAVE, William Everett, American physician: b. Farmington, Tenn., 12 Sept. 1869. He was graduated (1901) at George Washington University and became (1902–09) pathologist of the Bureau of Science at Manila, P. I., then chief of clinics and later director of the Philippine General Hospital and dean of the College of Surgery, University of the Philippines. He was (1903–04) president of the Manila Medical Society and (1905–06) president of the Philippine Islands Medical Association. He is editor of the *Bulletin of the Manila Medical Society.*

MUSH, moosh, Armenia, the chief town of the Mush sanjak, vilayet of Bitlis, 79 miles south of Erzerum, near the Kara-su, the eastern affluent of the Euphrates. It is built on a plateau 4,800 feet above sea-level, rising on the south side of a mountain-girt and fertile plain. It is an ill-built, unclean town, peopled by Turks and Armenian Christians. It has Gregorian and Roman Catholic bishops and an American Protestant mission and schools. A thriving trade is carried on in the tobacco, grape vine, wheat and other agricultural products of the adjacent plain. Mush is mentioned by Xenophon and Moses of Khorene, and came into prominence in 1894, owing to the massacre of Armenians at Sasun in the neighborhood. Pop. about 20,000.

MUSHROOM, a popular term loosely applied to many species of higher fungi, especially such as have a cap (pileus) upon an erect stalk. Primarily, the mushroom is *Agaricus campestris* (see FUNGI), the only species cultivated upon a commercial scale. Though more than 700 species of mushrooms have been proved edible within the last half century, and though many others will doubtless be proved harmless, the novice should be cautious in trying new species. Each unfamiliar kind should be subjected to rigid examination first by smell, and malodorous ones discarded; then by taste, a small piece being nibbled but not swallowed. If no ill results follow in the course of several hours, a small piece may be swallowed. If no evil effects follow, but the flavor raw is unpleasant, cooked morsels may be cautiously tried, and results noted. Each individual must decide what species agree with him, because some systems will not endure kinds innocuous to others. Nervous fear of fancied bad symptoms must be controlled, or real illness may be induced by the imagination.

Several species are popularly reputed virulent which do not produce any marked effect upon the health for several hours, and which are widely feared as deadly. Since the two commonest of these (*Amanita muscaria* and *A. phalloides*) are often mistaken for the common mushroom, the novice should never gather any toadstools in the woods under the impression that they are the proper mushroom, which grows in pastures, lawns, etc., and not in shady places. Further, all species with yellow or white gills should be avoided until known to be edible. The common mushroom has pink gills when young, and purplish-brown or black gills when mature.

Several of the thousand species of the genus *Agaricus* are valued for food, but the common mushroom (*A. campestris*) is the most important. It is occasionally found in open and grassy glades; never in the deep forest, but most frequently in old pastures and lawns, especially in autumn, but often when conditions are favorable during the summer. It grows about three inches tall, has a fleshy cap about three inches broad, generally white, sometimes reddish or brownish above and pink beneath. Its stem does not rise from a cup-like base as does that of *Amanita phalloides.* It is generally gathered in the «button» stage, that is, before the cap has expanded. Among its near relatives the best known is probably the horse mushroom (*A. arvensis*) which is much larger, whiter above, lighter below, the gills being white when young, but otherwise resembling the common species.

Success in mushroom growing seems to depend more upon the individual grower than upon the method, since two growers may each succeed equally with very different methods. The essentials seem to be decaying organic matter in abundance, uniform but not excessive moisture and equable rather low temperature. The most popular places for cultivating this plant are caves, abandoned mines and quarries, cellars, pits and similar places, where the temperature is naturally suitable or may be artificially controlled. The beds are usually made by spreading a layer of well-rotted manure and loam over a firmly packed deep layer of fresh horse-manure. After the violent heat of fermentation has passed and the temperature has fallen to or below 90° F., the mushroom «spawn» is planted. This spawn consists of the mycelium of the fungus in bricks (English) or flakes (French) made of equal parts of horse and cow manure and loam; it is a commercial article and its manufacture constitutes a business distinct from mushroom growing. After sowing, the bed is kept moist by mulching with straw or covering with mats which are replaced in about 10 days with a layer of loam about two inches deep. In America the mushroom is rarely cultivated out of doors; in Europe it often is, the temperature and moisture there being more favorable. It is frequently found growing wild in sufficient quantities to make commercial shipments profitable.

Besides the species already mentioned, several common American species are among the most desirable edible fungi. *Coprinus comatus,* the horse-tail or shaggy-mane mushroom, grows sometimes six inches tall, has a nearly cylindrical white shaggy cap with often black scales and white gills when young, but these turn black and liquefy with age. It is commonly found in lawns, waste places, rubbish heaps, etc., from midsummer until the coming of frost, especially after showers. *C. atramentarius,* the ink-cap, resembles the preceding in general appearance and places of growth. *C. micaceus,* the glistening coprinus, is a brownish species smaller than the preceding. It grows upon decaying wood. *Lepiota procera,* the parasol mushroom, and *L. naucina,* the smooth lepiota, grow in lawns, pastures and occasionally in gardens. They have white spores and a ring on the stems, to which the gills are usually not attached. *Cantharellus cibarius,* the chantrelle, grows about three inches tall, measures nearly as much across the cap, has an irregular top-shaped yellow or orange cap and has much-branched gills. It grows upon the ground in woods. *Maras-*

mius oreades, the fairy ring or champignon, is a small cream-colored or reddish species, which tends to grow in circles upon lawns and pastures. It is rather tough and solid, but is valued for its nutty flavor and its drying qualities. Its gills are alternately long and short. *Lactarius deliciosus* has an orange cap, an orange milky juice and with age shows greenish tints where bruised. *Boletus edulis,* the edible pore-mushroom, has a yellowish or brownish cap, with convex tubes which change with age from white to greenish yellow. It is commonest in chestnut, pine and oak woods during autumn. *Fistulina hepatica,* the liver-fungus, grows upon decaying wood, is stemless and of irregular form, red, succulent and fibrous. It is often called beefsteak-fungus on account of its edible qualities. *Morchella esculenta* and several relatives, popularly known as morels, are of various colors, but usually grayish or yellowish. The top somewhat resembles honeycomb, which makes them easily recognized. They delight in potash and are common where the land has been burned over or wood-ashes have been thrown; also in orchards and woods. *Lycoperdon giganteum* and other species of puff-balls, which are common in pastures, are considered among the best edible fungi if used while still white. They are more or less globular in form. The species mentioned sometimes attains a diameter of several feet.

Mushrooms are often said to be equal to meat in nutritive qualities, but these statements are not warranted by analysis, which show that fresh mushrooms contain about 88 per cent of water, 3.5 per cent of protein, 6.0 per cent of nitrogen-free extract, and generally less than one per cent each of fat, fibre and ash. The protein content is therefore less than one-fifth that of porterhouse steak, less than one-third that of dressed codfish and but little more than one-fourth that of hens' eggs. Indeed, according to analysis, they seem to be inferior to most vegetables. Their chief value is therefore in their flavors, which vary with individual species as much as among higher plants. They are eaten by various animals (see FUNGUS-EATERS).

Bibliography.— Falconer, 'How to Grow Mushrooms' (1892); Falconer, 'Farmers' Bulletin No. 57,' United States Department of Agriculture, Washington 1897; Farlow, 'Some Edible and Poisonous Fungi,' in United States Department of Agriculture Year Book (1894); Peck, 'Mushrooms and their Uses' (1897); Dallas and Burgin, 'Among the Mushrooms' (1900); Atkinson, 'Studies of American Fungi' (1900); McIlvaine, 'One Thousand American Fungi' (1900).

MUSHROOM GNATS. See FUNGUS-EATERS.

MUSIC is the science of combining tones in melodic, rhythmic and harmonic order, so as to excite the emotions or appeal to the intellect. For untold ages it was purely emotional. With its development as a science, in the Middle Ages, it appealed almost entirely to the intellect, this species of music culminating shortly before 1600. At the present time that music is considered best which appeals both to mind and emotion. It is the combination and equipoise of these two factors which causes Beethoven to be considered one of the chief masters, and the music of Wagner, with all its intensity of passion, to appeal also to the mental processes by its peculiar treatment of *Leitmotiven.*

Spencer and Huxley suggested imitations of nature (bird-songs, etc.) as a possible commencement of emotional music. Palæolithic man had his music, even instrumental music, as may be deduced from a primitive flute of reindeer's horn, found in a cave which was inhabited during the Stone Age. Many prehistoric horns of metal have been unearthed among the relics of the Bronze Age.

From two or three notes the scale grew into various intricate and widely differing forms. The five-toned (pentatonic) scale is the most primitive now in use among civilized nations. It was chiefly employed by the Chinese, even 4,000 years ago, but is also used in some hymns ('There is a Happy Land') and in many Scottish songs, such as 'Ye Banks and Braes,' or 'Auld Lang Syne.'

About 600 B.C. Pythagoras (see PYTHAGORAS) established the proportions of the intervals, and Music, always an artificial and a human product, was given a natural foundation. (See MODE; INTERVAL). It may be doubted whether harmony existed at all in the ancient world. It is absolutely certain that the Chinese, who were well advanced in the art in ancient days, and who formulated many acoustical principles before the time of Pythagoras, used melody without supporting harmonies. It is possible that the Greeks had a crude accompaniment of drone bass to some of their songs. The Scriptural music, loud ecstatic, and of an improvisional character, is a blind alley and does not lead to modern development of any kind. The music of both the old and new Testaments was orally transmitted and is not to be traced. Ancient Rome copied the Greek music but without fully understanding it. Rome conquered Greece but could not assimilate its culture, and in the first centuries of our era the musical art was retrogressing. The influence of the Christian Church stayed the decadence and gave a new direction to the art. Ambrose (about 340–398) and Gregory (540–604), stemmed the tide of decay and rescued some part of the ancient systems or modes. The power of music in the early Christian ritual is not only shown by the praises of the Fathers of the Church, but by the fact that the Emperor Julian in 361 endeavored to found a musical conservatory in Alexandria to educate boys to sing in the pagan rites as his adversaries were singing in the Christian churches. The Roman influence now extended the Gregorian chants all over the civilized world. Boethius (475–524) had written a treatise on the Roman system which became the misty textbook of the earliest days (see BOETHIUS). In 790 Pope Adrian sent singing teachers into France with missals illustrating the Gregorian modes. An antiphonarium was left at Saint Gallen which still exists and proves the earnestness of the musical mission. The music of this early period, however, is still very vague to us, since no practical notation existed. The musicians of this epoch sometimes employed alphabetical letters as notes (which could be deciphered) but more frequently a system of lines, curves, dots and dashes, called the

Neumes, which were only to aid the memory of one who had learned the song orally, but meant nothing definite to anyone who had not thus studied it.

A step forward was made by a monk named Hucbald, in Saint Amands, who improved the notation somewhat by using a staff (it is very doubtful if he invented it) and by writing certain rules regarding the union of different parts in music simultaneously. The reform seems, at first, to be a very great one, meaning nothing less than the birth of part-music, the evolution of a new science; but, when one knows that these parts were simply consecutive fifths or fourths, or other equally harsh progressions, one can only marvel that the men of the Middle Ages bore it so patiently. The new system was called the *Organum,* since it was often played upon the great wind instrument which had disappeared when Rome went down, and reappeared in Europe in the reigns of King Pepin and the Emperor Charlemagne.

A much greater reformer than Hucbald came upon the scene about 1000 A.D. Guido, an excellent monk of Arezzo, founded the system of sight-reading, by establishing a vocal scale on the syllables still in use. He noticed that the hymn to Saint John (patron saint of singers) rose step by step from C to the following words:

(C) UT queant laxis,
(D) REsonare fibris,
(E) MIra gestorum
(F) FAmuli tuorum.
(G) SOLve polluti
(A) LAbii reatum,
Sancte Johannes

causing his choir-boys to memorize the syllables from the melody of their chief hymn, he soon taught them intervals by this simple means, and his treatise «De ignoto cantu» was the first practical mode of singing «an unknown song» (that is, a song unknown before to the singer), in short, the birth of sight-singing. It must be confessed, however, that Guido's claims to this tremendous discovery have been contested, and that every point connected with the rise of the science of music is more or less wrapped in vagueness and doubt.

We come to somewhat firmer ground a little later when notes of definite length are introduced. Franco of Cologne may be credited with the first clear treatise upon such a system (he calls it «Ars Cantus Mensurabilis») in the first half of the 13th century.

And now there came a recession from the evil-sounding fourths and fifths that had existed in the 10th century, and from some equally harsh progressions that were countenanced long after this. The troubadours in France and the minnesingers in Germany had brought forth secular music that broke many of the old rules yet sounded infinitely better than the more «regular» music. The musical canons of the ecclesiastics began to broaden. Marchettus of Padua and Jean de Muris, both in the middle of the 14th century, began to urge new progressions and the consecutive fifths were tabooed, only to reapper copiously in the most modern works of the 20th century.

It will be impossible in an outline sketch to give all the attempts that were made in evolving the new science, from the 11th to the 14th centuries. Suffice it to say that out of these efforts there grew the first real school of composition, and instead of its having birth in Rome, it was born in the Netherlands and in Flanders. Yet the Flemish school at once gave its services to the Church, and many of its greatest representatives in its earliest stages went to Rome as servants of the Catholic cause. The Flemish school may be called the true beginning of the science of music, since now, for the first time, a race of composers existed who worked according to definite rules in the production of intricate counterpoint, and were able to impart their knowledge to their pupils. William Dufay was the first of this line of composers. His epoch is mistakenly given in many histories as falling in the 14th century, but the researches of F. X. Haberl have proved that he was born shortly after 1400. He died 27 Nov. 1474. The chief of his contemporaries were Hobrecht, Eloy, Brasart and Binchois, who have, however, left little more than their names, and even of Dufay very little music is extant.

The first great teacher of the school was John Ockeghem or Ockenheim (about 1430–1513), and among his pupils was the first great contrapuntist of that time, practically the first great composer that the world had ever possessed,— Josquin Des Pres,— whose music Martin Luther delighted in. Des Pres was born about 1440 and died either in 1515 or 1521. Other pupils of Ockeghem were De la Rue, Brumel and Agricola. All the music of the foregoing composers was purely intellectual, but with Des Pres we find the first glimmerings of emotion mingled with the musical mathematics, and he taught that dissonances could be used to express passionate feeling.

The greatest figure in the Flemish school, however, is Orlando Di Lasso (1520–94), who composed works which are beautiful even to modern ears. The Flemish school ended with this culmination. It had existed about two centuries and in that time it had brought forth the science of composition and some 300 composers.

There was, however, another country which helped greatly in this result. The first musical dictionary ever written, by John Tinctor (1476), gives the credit of the invention of counterpoint to the English, and a manuscript of a canon for six voices, in the British Museum, would seem to show that there were very skilful composers in England as early as in the 13th century. This canon «Sumer is icumen in») ascribed by some to John of Reading, in 1250, by others to a much earlier date, is a surprisingly advanced work for its epoch. A mysterious figure looms up as an English contemporary of Dufay, in John Dunstable, but of the music of this Englishman (who died about 1458) very little is known, only a few fragments remaining.

Contemporaneous with the later Flemish writers one finds a few Italian composers forming a school of their own. The first of the old Italian school was Costanza Festa, a Florentine, who died in 1545. But the one great master in this field was Palestrina (born probably in 1524 — there is much doubt about the date of birth,—and died 1594), who was without doubt the greatest composer up to that time. He combined the Flemish ingenuity with a lofty dignity and sometimes (as in his ‘Improperia’) with emotional power.

The year 1594 was an epoch year in music. The Flemish school ended in that year, with Di Lasso's death; the Italian school lost its chief master in Palestrina; a revulsion against the intellectuality of music took place,— and the first opera was written.

We pause here, therefore, to sum up a few other points in musical evolution that had preceded this important date.

Although the chief scientific music of the world had been ecclesiastical up to this point, the troubadours in France, and the minnesingers in Germany, had turned the attention of cultured minds to the beauties of secular singing. Instrumental music was as yet a Cinderella among the arts. The strolling jongleurs and wandering minstrels amused the people, and sometimes the nobility, with displays of skill upon various instruments, combined with juggling tricks. They were generally under the ban of the law and led a very precarious existence. Troubadours and minnesingers wrote melody only, without harmony.

One of the trouvères of France,—Adam de la Halle,— in the latter half of the 13th century, had written a musical play, entitled ‘Robin et Marion,’ which was the precursor of light opera. It is the earliest popular work of which we have any record, but it was written by ear, and not by any teachable rules. Venice, partly through the efforts of Flemings, partly through Italian influence, had become a centre of organ-playing. Adrian Willaert (1480–1562), a Fleming, had become organist of St. Mark's in Venice and drew many pupils thither, among them Di Rore, Zarlino and Andrea Gabrieli. The last-named taught his nephew, Giovanni Gabrieli, who became one of the noblest composers of the Venetian school. He was born in 1557 and died in 1613. Zarlino taught many German pupils, and through the Venetian school of organ-playing. Germany for the first time came in close musical touch with Italy. Zarlino taught Scheidt, Praetorius and Scheidemann, while the elder Gabrieli had Hans Leo Hassler as a pupil. Zarlino and Willaert were the first to agitate for a tempering of the musical scale (see TEMPERAMENT), but its establishment came much later through the wisdom of Bach.

Claudio Merulo (1533–1604) established the organ toccata, probably the earliest form of technical instrumental display in the modern sense. One other form of scientific secular music had arisen, thanks to the Netherlanders; the madrigal, an unaccompanied vocal composition displaying the most intricate counterpoint had come into vogue, and Willaert and Di Lasso had achieved triumphs in this school. Luca Marenzio (1556–99) had also done good work in this field. But the most charming madrigal composers were to be found in England, where this style of singing met with especial favor. It is customary to vaunt the glory of the Elizabethan poets, but if the tremendous name of Shakespeare be eliminated, the excellence of the contrapuntists at this time rivals that of their literary brethren. Tallis, Weelkes, Wilbye, Morley, Farrant, Byrd, Bull, Ford, etc., may well be cited as balancing Beaumont, Fletcher, Massinger, Marlowe, Jonson, etc.

Music-printing (see PRINTING) had also been established, in 1502, by Petrucci of Fossombrone, and caused the compositions of all these men to spread from country to country with great rapidity.

The change from the old school of pure counterpoint to a more emotional style, from intricate choral works to solos both vocal and instrumental, had its first practical demonstration in 1594 (some place the date two years later), by the composition and performance of the first opera, entitled ‘Daphne.’ The work was the outcome of the efforts of a coterie of cultivated amateurs who began their meetings in Florence, and endeavored to bring into music something of what they supposed it to have possessed in ancient Greece. The men who were active in this movement, which caused the renascence of music, were Giovanni Bardi (Count Vernio), Vincenzo Galilei, Strozzi, Mei, Rinuccini, Caccini and Peri. Their first opera met with great success, but their second,— ‘Euridice’— was an epoch-making work, since it contained in embryo an entirely new mode of musical treatment. Counterpoint was replaced by monody, solo singing began, and recitative allowed musical declamation to take the place of intricate tonal construction. The libretto was the work of Rinuccini, while the music was written by Peri and Caccini in two versions, that of the former being the better.

The new school spread quickly to all countries, only in France its progress was checked by the power of Lulli, who devoted himself chiefly to ballet-music. The latter was largely introduced into Molière's plays and obtained the favor of Louis XIV, who sometimes appeared himself in the dances.

The opera was not the only form of the period of phenomenal musical activity which marked the closing of the 16th century and the beginning of the 17th. The oratorio also had its beginning in this wonderful era. Filippo Neri (1515–95), who has since been canonized by the church, was an enthusiast in the matter of good church music and at his church in Rome he frequently had religious meetings apart from the regular services, in which he portrayed Scriptural subjects in the shape of musical plays. His friend Palestrina often assisted in this pious work, and may have had a hand in the development of the great sacred form. As these entertainments did not take place in the body of the church, but in the Oratory (Oratorio), the origin of the name of this form will readily be seen.

But the real establishment of the form came with Emilio del Cavaliere (1550–98), who wrote a large work in the new style, entitled ‘L'Anima e Corpo.’ This was first performed in 1600, probably in the church where Neri had labored, and was given upon a stage, with costume and action, exactly as it it were an opera. Although both Neri and Cavaliere were dead, such minute directions were left regarding the mode of presenting the work that one may presume that the intentions of the composer were thoroughly carried out. This first oratorio was so entirely in the new school of monody and declamation that one may doubt as to whether the establishment of opera is not in a large degree to be credited to Del Cavaliere.

Besides the opera and oratorio, instrumental forms were established at this time as well. Dancing is the mother of instrumental form. The dances of Spain had gradually made their way into France and exerted a strong influence upon classical music. In an effort to obtain contrasts several of these were joined together in one large composition, which was at first called a partita, but afterward became a suite.

Free instrumental forms also sprang from the organ toccatas already alluded to. Frescobaldi (1588–1653) was to Rome what Willaert had been to Venice half a century before. Frescobaldi has been called the father of true organ-playing. He improved the toccata and called it *sonata* (a sounding-piece,— that is, an instrumental piece), to distinguish it from the *cantata,* — the singing piece. Corelli (1653–1713) gave to the old sonata a form, which, although much less important than the later, classical shape, had yet within itself the elements of the noble form. Its first movement was a large three-division shape, exposition, development and recapitulation; and this led to the *Sonata-Allegro,* the first movement-form of the classical symphonies and sonatas, the form of many noble overtures.

Amid all these remarkable advances the fugue remained rigid and lifeless, a survival of the old intellectual problem-music. As yet the fugue was little more than a canon, a continuous imitation of a given melody. It waited its liberator — Bach.

During the century which followed we find Italy combining contrapuntal skill with the less educated enthusiasm which marked the early operas, and such men as Monteverde (1568–1643) and eventually Alessandro Scarlatti (1659–1725) make of the new school something far better than its founders had dreamed of. Stradella, Carissimi, Lotti and Rossi added to the advance of the great new school which was to cause Italy to be justly called the «Mother of Music.» The school was established in England too by Henry Purcell (1658–95), who even introduced the Italian musical signs and expression-marks into his native country. Purcell, who was the greatest musical genius that England ever produced, founded his own English operas upon the Italian models, but his works had characteristics entirely their own and extend all the way from the melody of ‹Lilliburlero› (the revolutionary song of 1688) to the loftiest anthems and brightest operas.

In France the great Lulli (1633–87) was bringing forth the most dainty and graceful ballets. In Germany Reinhard Keiser (1673–1739) began the 18th century by endeavoring to form a German school of opera, but the Italian operas soon resumed their sway.

In Germany, also, the effect of the numerous students who had gone down to Venice in the 16th century and the beginning of the 17th, was beginning to make itself felt. Luther's influence had established the chorale as a sturdy root whence much sacred music was to grow. Perhaps the three men who most helped the growth of Germany's sacred music in its earliest post-Lutheran stages were the «three Ss,»— Schütz (1585–1672), Scheidt (1587–1654) and Schein (1586–1630), who not only helped Italian music in the Fatherland, but elevated the style of organ-playing far above anything that Italy had done. Musical settings of the Passion began to appear in Germany, and the oratorio took a nobler path than in Italy, even before the appearance of Bach and Handel. To Germany also was due the new arrangement of part music, which took the melody out of the tenor voice, where it had always been in the Flemish and old Italian music, and placed it in the soprano, a change due to the choral-singing of the 16th and 17th centuries.

Out of the great musical epoch at the beginning of the 17th century there came also a radical change of notation. The notation of Franco of Cologne had been improved by the invention of many additional rhythms and the employment of smaller notes. In the music of Palestrina and of Orlando di Lasso, that is to say up to 1594, one finds some half-dozen tonalities (keys) employed, and notes and rests down to 16ths. But one does not yet discover a rational division of music into measures. This great advance came shortly after 1600, with the new monody, the declamatory music of the early operas, and with this came also, for the first time, the use of terms of tempo and of expression. Even the grouping of notes was invented in the latter part of the 17th century, so that this epoch saw the establishment of the greater part of our present notation system. Music of the better class, printed after 1700, is without any very important difference from that printed to-day.

And now the procession of the tone-masters who are prized by the modern world begins. Bach (1685–1750) and Handel (1685–1759) were so exactly contemporaneous that many speak of them as if they had been the Siamese twins of music. Yet their influence was very divergent. Bach leaned toward the old school of pure counterpoint; Handel was impelled toward modern dramatic effects. They faced different ways. Handel led toward orchestral experiments and was more directly melodic than Bach. We owe to him the noblest form of oratorio, which, by the way, he did not attempt seriously until after his 50th year.

To Bach we owe debts far more varied and even greater. He reconciled the old diatonic style of composition with the newer more modulatory school; by his great organ works and his clavichord fugues he founded modern technique; he was the father of the best school of organ-playing; he composed the greatest mass (that in B minor) which the world possesses, and also the noblest Passion music, and he was absolutely the inventor of freedom of modulation. Before his time, by what is called «mean temperament,» it was possible to modulate into some three or four major and minor keys. Bach in 1722 gave to the world the first book of his «Well-tempered Clavichord,» the composer's declaration of independence —«We hold that all keys are created free and equal!» (See TEMPERAMENT). In 1740 he wrote the second book, riveting the great reform.

Opera in the meantime had lost its opening splendor. Intoxicated by the success of the new style of music the composers began to believe that poetry was a secondary matter in the wedding of the arts, and in allowing their music to pursue an independent path all dramatic purport was soon lost. A reformer was needed and he soon came. Gluck (1714–87) began a crusade against the meaningless character of many of the beautiful melodies of the

Italian opera. In 1776 his opera of ‹Orpheus› (which still holds the stage) began the dramatic school of operatic music. Beethoven followed in this path, and Mozart managed to reconcile melodic grace and dramatic content.

In carrying this sketch to its conclusion we must now trace three intertwining paths — piano music, orchestral music and operatic and other vocal music. Naturally we shall be able to allude only to epoch-making composers.

In 1709 Cristofori, an Italian, invented the pianoforte. The instrument was at first neglected. Bach thought it fit only for rondos. Mozart used the spinet, as did Haydn. It was Beethoven who first turned the tide toward the new instrument. Instrumental technique grew up in the train of the new invention. Domenico Scarlatti (1683–1757) led toward a piano style while writing for the spinet. In 1752 Philipp Em. Bach published the first valuable book of technique, which could be applied to the piano, to the clavichord, or the spinet.

The classical piano sonata grew gradually from a combination of the ideas of the suite and of the first movement of the old sonata as established by Corelli. Haydn first established it, Mozart improved it and Beethoven brought it to its culmination. The symphony was but a larger form of sonata, for orchestra, and the same process of evolution took place. Seldom has a form reached its zenith more quickly; from the first symphony, composed by Haydn (in three movements and for eight instruments only) in 1759, to the tremendous ninth symphony of Beethoven, composed in 1824, is but 65 years, yet these years contain all that is pertinent to the birth, growth and climax of every form of sonata,— in which we include classical chamber music, string quartettes, quintettes, etc., and orchestral works such as symphonies and concertos.

Just as there was a most significant musical epoch from about 1590 to 1620, so we find the «classical period,» from about 1775 to 1825 to present not only a marvelous amount of creative energy, but a change in the musical taste of the world, a transformation of the scope and style of music. Only the opera went on its uninterrupted path. Yet here, too, there were some changes.

Beethoven (1770–1827) was an instrumental, an orchestral composer, par excellence. His one opera, ‹Fidelio,› great art-work though it was, exerted no special influence upon any school of composition. Mozart (1756–91) improved the style of the Italians in opera, but did not actually strike out a new path. His ‹Don Giovanni,› for a long time the masterpiece of the world in the operatic form, was but a culmination of what Italy had already attempted. Rossini (1792–1868) with a pernicious habit of creating the most beautiful melodies whether they fitted the text or not, set back the hands of the clock of musical progress, as far as opera was concerned, for a good half-century.

The first ringing note of the newer and truer school of dramatic opera was heard when Von Weber (1786–1826) in 1820 completed his ‹Freischütz,› an opera built upon the sure foundation of the folk-song, a dramatic work, thoroughly wedding its poetry and music.

The sacred forms, during the classical epoch, did not change materially. Beethoven wrote a most intricate mass, but it was only an echo of Bach with his great polyphonic B minor mass. Mozart composed, almost upon his death-bed, a noble requiem, but it was only an addition of operatic flavor to the requiems that had preceded. Cherubini (1760–1842) wrote a couple of requiems that were as great as any of the school — but were not in any sense innovations.

Piano and orchestral works advanced the most in the classical half-century. The vastest piano-work existing to-day is probably Beethoven's B flat sonata, Op. 106.

The orchestra, in the modern sense, had its birth in the classical half-century. Bach and Handel made only outline sketches of their orchestral works, leaving much for modern commentators to fill in. But when Haydn came to England, in 1791, he directed a complete orchestra and he published complete orchestral scores, an epoch in the history of orchestral development. Mozart had, however, before this time, written a large number of symphonies in complete score, many of which were published at a later period. Although the modern orchestra and the full score had their origin in this remarkable epoch, the art of conducting came later. Mendelssohn and Berlioz may be named as the first really great conductors in the modern definition of the word. The use of the baton in conducting only became established after 1800.

One other important evolution must be added to the work of the 50 years which form such a golden epoch of musical creation. The songs of Europe, such as had any real worth, were almost altogether folk-songs, melodies which grew up as the briar rose by the wayside of art, not the careful product of great composers, but the spontaneous voice of the people. The songs of the composers were generally dull and artificial things, made so, perhaps, by the fact that the poets were not concerning themselves with short and lyrical forms. But when Goethe and Heine, in Germany, began writing beautiful lyrical poems, the song-composer was sure to follow soon. Franz Schubert (1797–1828) was the genius who evolved the ‹Lied,› the artistic song which, however short, was yet a complete and perfect whole; as a tiny Meissonier painting is as perfect in its way as the largest canvas. Schubert added glorious works to the symphonic repertoire, his piano-works practically founded the «Minuet-form,» yet he thought vocally, and his most spontaneous and most important works we consider to be his ‹Lieder,› which songs began a new school.

We may now follow the three distinct musical paths,— vocal forms (including opera), piano music and orchestral music,— each by itself, to the present time. Continuing the song development, we find Schumann (1810–56), and Robert Franz (1815–92) following in the footsteps of Schubert and bringing the miniature vocal form to perfection. The operatic form took a wide deviation.

The work of Rossini was baleful only in the fact that it paid no heed to the wedding of words and music in dramatic unity. In light operas Rossini was a model, and his ‹Barber of Seville› is a masterpiece. Once, and once only, he proved that he could write a truly dramatic opera, and produced ‹William Tell.› Donizetti (1797–1848), Bellini (1802–35), and others, followed his lead and wrote charmingly, but untruthfully. France compromised and united prettiness and some degree of dramatic feeling in the works of Gounod (1818–93) and of Ambroise Thomas (1811–96). The real reform, however, of this *mésalliance* of poetrv and music was made by Richard Wagner (1813–83).

Wagner's combat and triumph have been too recent to require detail here. We need only state that his theories of opera, or «music-drama» as he preferred to call it, were:

1. The abolition of a set form (that is, ending as one began), and the use of any shape that the poem suggested.
2. Absolute unity of the entire work. No division into songs, duets, choruses, with applause between and sometimes even encores. Continuity from beginning to end.
3. The music is always to interpret the poetry. Its entire character is to be dictated by the words: "Music is Truth." "In the wedding of the arts Poetry is the man, Music the woman"; "Poetry must lead, Music must follow"; "Music is the handmaid of Poetry"; are a few of Wagner's apothegms.
4. Abolition of mere tune and the substitution of a melodic recitative, called the "Melos."
5. Absolute freedom of modulation. Not necessarily a fixed tonality to any work or part of it. "Swimming in a sea of tone."
6. Excellence of libretto. No book is fit to be used for the text of an opera unless it would make a successful drama by itself.
7. A constant use of the Leit-motif (a musical figure expressing a definite meaning) by which the orchestra speaks a language that can be comprehended, somewhat like the chorus used to do in the old Greek tragedies. (See LEIT-MOTIF.)

These are not all of the theories that Wagner evolved, but they are the most important. They did not spring into being at once. One sees a few of them in ‹Tannhäuser,› more in ‹Lohengrin,› but the fulness of his reforms is first revealed in ‹Tristan und Isolde.›

Wagner's work has influenced all the modern opera composers. Verdi (1813–1901) had begun his career in Italy almost upon the lines of his predecessors. Thanks to his genius he soon began to carve out a better vein for himself. In his ‹Aida› he began to lead Italy to a much finer and truer school of opera than it had ever possessed. In ‹Otello› and ‹Falstaff› while carefully discarding the «Leit-motif» he seems to arrive at almost all the other Wagnerian conclusions, although his Italian personality prevents any great resemblance in results. In France, Bizet (1838–75), the best of French operatic composers, was starting upon a similar path with ‹Carmen› when death interrupted his career. America has begun to add to the repertoire. Paine and Chadwick began the modern work, but important operas have since been composed by Horatio Parker, Nevin, Cadman, Gilbert, Herbert, Converse, Damrosch and others.

Tracing the piano path from the time of Beethoven we find three great «Cs» in technical writing — Czerny (1791–1857), Clementi (1752–1832) and Cramer (1771–1858). These led to a modern technique and this bore fruit in two different directions. Liszt (1811–86) became the king of the piano and brought its technical power to a point that had never been suspected before his time. Chopin (1809–49) came as the poet of the piano and gave to the instrument its most beautiful phases of expression. A host of piano composers have sprung up in every civilized country, Russia furnishing a great number.

In connection with the rise of technique we may speak of the advance in other branches of music. Italy had great singing schools in the 18th century, and some of the most famous vocal teachers. Nicolo Porpora (1686–1766) was the most eminent of these, and had as pupils some of the most renowned singers of his day, among them Farinelli (Carlo Broschi) who was reputed to be unrivaled in flexibility and in power. Pistocchi was another of the famous teachers of this epoch and his most famous pupil,— Senesino,— disputed the palm even with Farinelli, in England in Handel's time. Vocal technique could scarcely go further than it advanced in the 18th century, although the 19th furnished such singers as Catalani, Malibran, Mario, Rubini, Lablache, Jenny Lind, and later such artists as Jean De Reszke, Adelina Patti, and, in the dramatic school, Materna, Tietjens, etc.

In violin technique the chief advance was begun in the 17th century, when Corelli (1653–1713) was the most prominent teacher of Italy. At about this time, too, the golden period of violin making began and the Amatis, Stradivarius and the Guarnerii made the name of Cremona (the city in which they worked) famous all over the world. The king of all violinists, speaking entirely from the standpoint of virtuosity, was Paganini (1784–1840) who advanced technique so far that even to-day the greatest living violinists are unable to conquer all of the difficulties which he left as a legacy to the world. Since his time the sceptre has passed to Joachim (1831–1907), who held it for many years, but in his old age, saw it contended for by a host of advanced players. Paganini influenced violin music toward mere virtuosity, while such players as Joachim, Wilhelmj or Wieniawski combined musical feeling with technique in their work. In recent days Ysaye and Kreisler take the lead in this field.

Orchestral advance has been absolutely phenomenal since Beethoven made his developments in tone-coloring. Berlioz (1803–69) was the first to improve upon the great pioneer's work and achieved remarkable results by his various experiments with new combinations. Wagner carried the art of orchestration still higher in his operas, and since his death a whole host of great tone-colorists have arisen. Russia has contributed very much to this advance, and it is not an absurd prophecy to predict that the Slav may attain the orchestral supremacy of the world in the near future. Tschaikowsky (1840–93) appears to be the greatest genius in this field that Russia has yet produced.

In Russia, however, there was, at the end of the 19th century, a decided movement toward a national school, headed by the so-called «Big Five» — Rimski-Korsakoff, Borodin, Cui, Moussorgsky and Balakireff, and such composers as Rachmaninoff, Glazounoff, Tanaieff, Scriabine and Stravinsky have helped the orchestral advance, the two latter being especially radical and ultra-modern in style.

France has also advanced greatly in the orchestral field thanks chiefly to the naturalized Belgian, César Franck (1822–90), who taught many of its chief composers of recent days and himself wrote many noble works. Massenet, Saint Saens, D'Indy, Charpentier, Pierne, Chabrier and many others have advanced the orchestral standard or have written what may be called symphonic operas. There is much freedom of form in the neo-Gallic school. Debussy (1862–1918) and Ravel have established a new school of orchestral treatment, the former being remarkable in delicacy and subtle coloring as well as for the frequent employment of a scale consisting entirely of whole tones.

Germany has developed chiefly along the Wagnerian lines, not an unmixed blessing when applied to purely orchestral music. After Beethoven there came a period of dulness in the symphonic field. Mendelssohn (1809–47) wrote much symmetrical orchestral music, but in spite of his melodic grace and symmetrical style he was not of the stuff of which epoch-men are made. It was Schumann (1810–56) who led the campaign against following too slavishly the classical paths and through this the romantic school and the freer sonata forms came into modern music. Brahms (1833–97) by his great symphonies and other sonata forms has proved, however, that the classical school does not merely belong to a by-gone epoch. Richard Strauss (1864—) has followed the Wagnerian system in all of the theories given above. He has exhibited overwhelming skill in both operatic and orchestral works, and occasionally genius, but «Richard, the second» has not yet rivaled his predecessor in the power of his ideas, although he may be classed as a very important living composer. German music has gravitated rather toward skill than poetry in its recent manifestations, and Mex Reger and many others have striven for very large scores and many instrumental complexities.

Under the lead of Richard Strauss the chief modern orchestral tendency is toward «Programme-music,» instrumental music, which by means of its title or program notes gives a definite picture. Along with Berlioz, Franz Liszt (1811–86) was the founder of this school of work. It is beginning to dawn upon the world that Liszt's orchestral works were fully as important as his piano compositions. He has led to great brilliancy of tone-coloring, and in his ‹Poëmes Symphoniques,› to freedom of form and dramatic power.

England too has heard the modern voice and her precise and correct contrapuntal school as represented by Mackenzie, Stainer and others, has given way to a much freer and bolder expression as shown in the works of Elgar, Delius, Bantock, Holbrooke, etc.

Even Italy is influenced by the orchestral tendencies of the present and the operas of Puccini, Wolf-Ferrari, Mascagni and Leoncavallo, and the cantatas of Bossi, no longer give the voice great preponderance over the orchestra and no longer treat the latter as a mere accompaniment. One Italian, Ferruccio Busoni, has plunged headlong into the German school of advanced orchestral works of freest form.

Scandinavia deserves great credit for the nationalism of her best music. As in Russia, her chief composers endeavor to reflect the spirit of their native folk-music in their classical works. Grieg (1843–1907) was the chief founder of this style, but Sinding and Sibelius have given important works in the same vein and the last-named has recently attempted the most free and radical modes of modern expression.

America has been especially fertile in the orchestral field. The real classical beginnings were made by John K. Paine, and a little later by George W. Chadwick, but at present Foote, Converse, Carpenter, Hadley, Schelling, Gilbert, Cadman and many others are writing in the largest forms. MacDowell's (1861–1908) orchestral works, as well as his piano compositions, have a place in the standard repertoire of all nations, and Horatio Parker has composed the first great American oratorio — ‹Hora Novissima.›

Women composers are more numerous now than at any previous epoch in the world's history. Ethel Mary Smyth, in England; Mrs. H. H. A. Beach, in America; Augusta Holmes (1847–1903), in Paris, and many others, have composed good works in the largest musical forms.

It is difficult to prophesy what the future may bring in musical development. Music is the most changeable of arts. Like language it is an invention of man, and even if founded upon natural laws it is still an artificial and, therefore, a changeable product. There is at present a decided tendency toward great complexity and cryptic expression; heavy scores and epic prolixity are constantly in evidence. Whether this is but a passing phase time only can show. Conservative musicians are aghast at the many bold experiments which are being attempted. We believe, however, that when the experimental stage is passed the tremendous orchestral skill that has been won will be retained, but that it will be again combined with the melodic grace and beauty of the older masters, and that Beethoven's apothegm will be re-established — «Music, even when picturing something ugly, must itself remain beautiful.»

Bibliography.—Ambrose, ‹Geschichte der Musik›; Aubry, ‹Troubadours and Trouvères›; Baker, ‹Bibliographical Dictionary of Musicians›; id., ‹Music of North American Indians›; Baltzell, ‹Dictionary of Musicians›; Banister, ‹Musical Analysis›; Bie, ‹History of Pianoforte Music›; Breakspeare, ‹Life of Mozart›; Brendel, ‹Geschichte der Musik›; Blaserna, ‹Sound and Music› (acoustica); Dickinson, ‹The Study of Musical History›; D'Indy, ‹Beethoven›; Dunhill, ‹Chamber Music›; Elson, A., ‹The Book of Musical Knowledge›; ‹Club Programmes of Many Nations›; ‹A Critical History of Opera›; ‹The Orchestral Instruments and their Use›; Elson, L. C., ‹Errors and Disputed Points in Music›; ‹The Curiosities of Music›; ‹The Great Composers and their Work›; ‹The History of German Song›; ‹Our National Music and its Sources›; ‹Theory of Music›; ‹The History of American Music›; Engel, ‹The Music of Most Ancient Nations›; Fetis, ‹Histoire générale de la musique›; Finck, ‹Richard Strauss›; id., ‹Songs and Songwriters›; id., ‹Wagner and His Works›; Fletcher, ‹Indian Story and Song from North America›; Forsyth, ‹Orchestration›; Grove, ‹Dictionary of Music and Musicians›; Hadow, ‹Studies in Modern Music›; Henderson, ‹How Music Devoleped›; ‹The Story of Music›; Hood, ‹History of Church Music in New England›; Hopkins, ‹The Organ, Its History and Construction›; Hughes and Elson, ‹Contemporary American Composers›; Huneker, ‹Liszt›; Krehbiel, H. E., ‹A Book of Operas›; id., ‹A New Book of Operas›;

id., ‹How to Listen to Music›; id., ‹Music and Manners in the Classical Period›; Lavignac, ‹Musical Education›; Maitland, ‹English Music in the 19th Century›; Matthews, ‹The Great in Music›; id., ‹How to Understand Music›; Miller, ‹Science of Musical Sounds›; Niecks, ‹Life of Chopin›; Newman, ‹Wagner, the Man and the Musician›; Newmarch, ‹Russian Opera›; Paine (ed.), ‹Famous Composers and their Works›; Parry, ‹Bach›; id., ‹The Evolution of the Art of Music›; Pauer, ‹Dictionary of Pianists›; Pole, ‹The Philosophy of Music›; Pratt, ‹History of Music›; Prout, ‹The Orchestra›; Riemann, ‹Dictionary of Music›; ‹Schumann, Life and Works›; Rimbault, ‹The Pianoforte, its Origin, Construction, etc.›; Rambosson, ‹Harmonies du son›; Rowbotham, ‹History of Music›; id., ‹Troubadours and Courts of Love›; Reissman, ‹Geschichte der Musik›; Stainer and Barrett, ‹Musical Dictionary›; Streatfield, ‹Masters of Italian Music›; id., ‹The Opera›; id., ‹Hundel›; Schumann, ‹Music and Musicians›; Sonneck, ‹Early American Opera›; id., ‹Early Concert Life in America›; id., ‹The Star-Spangled Banner›; Thayer, ‹Beethoven› (German); Weitzmann, ‹History of Pianoforte›; Williams, ‹The Story of Notation›; Zahm, ‹Sound and Music› (Acoustics).

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MUSIC, Children's, a somewhat ambiguous phrase which may be applied to music written specially for children or music produced by them. As used in this article, the term covers the broad, educational phase of the subject as to what may and should be done to make the noblest of the arts an important factor in the child's spiritual development. The purpose of this article is, therefore, to point out the necessity for intelligent treatment of children's music and to outline some ways and means by which the musical side of a child's nature may be developed fully and naturally. The need of such an encyclopædic article is obvious. There is hardly a subject that is so shamefully overlooked and so little understood by parents and others as the educational and cultural significance of music. Even in our schools, where better consideration and fuller comprehension might be expected, music teaching falls far short of its cultural possibilities. In our homes, naturally, the state of music and musical instruction is generally worse, due largely to the mediocrity of the average music teacher. «It is doubtful,» says one of our foremost musical educators, «whether there is any subject of instruction which is taught so carelessly, so ignorantly, so improperly, and by so many people who are by nature and training unfit to teach, as music.»

But methods of teaching, save in their general educational aspect, do not come within the scope of the present article. These and the various other technical phases of music and music-teaching are adequately treated under their appropriate headings.

The Educational Value of Music.— Quite apart from such general considerations as have long been adduced in support of music's claims as the purest, the noblest and the most universal of the arts — which, of course, cannot be enumerated here — there are several very weighty reasons why music is peculiarly fitted to serve as the first art in the education of the young. One of these is found in the fact that music, although the most abstract (subjective) of all the arts, is the only art that can be apprehended in early childhood. The normal human infant sings and is susceptible to song long before he can talk or walk — certainly very long before he is sufficiently sensitive to color vibrations and other complex sensory impressions. Thus, at an age when children can neither draw nor mold nor read nor write, they can enter the kingdom of beauty through music. «By singing, and by singing only,» says Mr. T. W. Surette, «a little child of five may come in contact with a pure and perfect form of beauty.» Just because music is an abstract art, an art which has no necessary objective reference (like painting and sculpture, for instance), it lends itself so admirably to the expression of that idealism with which every normal child is endowed by nature.

Another important educational advantage possessed by music is its great socializing tendency. For very young children music means, or should mean, primarily singing; and singing for them should imply, principally, group-singing. Now, such singing, be it the spontaneous duets of the nursery or the more conscious choruses of school and other assemblies, is a decidedly social activity requiring a degree of co-operation and self-abnegation not called forth by any other abstract. When children sing in unison — and adults, too, for that matter — their natures tend to lose much of their angular, anti-social individuality. Incidentally, such exercises afford invaluable practice in concentration and co-ordination — concentration of attention and co-ordination of eye, ear and mind — which promote a degree of mental alertness and precision hardly result from participation in any other cultural art.

A third reason for the educational pre-eminence of music — and many others could be given, did space permit — is found in the fact that, being the purest of the arts, music is, in the words of Montesquieu, «the only one of the arts which cannot corrupt the mind.» That this is another very important educational advantage goes without saying. For, however young or immature a child may be, its mind cannot be debased by bad music in the manner of «spicy» stories or obscene pictures. Music as such is neither moral nor immoral, as has been repeatedly pointed out; it is *un*moral. It is not before music is wedded to some other means of expression (language, acting, etc.) that it assumes any definite meaning. If the result of such union proves to be ethically undesirable, the objectionable element is not the music, which is not definitive like sculpture or painting, but the concrete medium with which it happens to be united. Even in the sad case of «rag-time,» the «dime-novel of music,» as it has been aptly called, the harm lies more in the vulgar and highly suggestive words than in the meretricious melody. Thus, while cheap and noisome music, if long persisted in, may pervert a child's musical taste, it cannot undermine its morals. The loss in the former case is negative; in the latter, positive. The first belongs to the sphere of æsthetics; the second, to that of ethics. It is this negative quality of music, the ideal of all art, that makes it so well suited to serve as the first and foremost cultural art in the spiritual education of the young — an art which, properly presented, enlarges a child's sympathies, broadens its emotional experience, gives greater play to its innate idealism and increases its capacity for joy in numberless ways.

The Need for Early Music-Training.— In view of the great educational, social and cultural importance of music, its neglect in our homes is as inexcusable as it is unaccountable. Yet, so general is this neglect that most children grow up to manhood and womanhood without ever becoming really musical. Even «of the thousands of people who consider themselves musical,» say two prominent American writers on music, «it is surprising how few have any real appreciation of it.» But if American adults are, as a class, unmusical, while American children are for the most part musical — and both are facts generally admitted by musical educators — the fault can lie only in the wasted musical opportunities of childhood. «If the natural taste of our children for music were properly developed,» says a distinguished musical authority, «they would continue to practice it and to find pleasure in doing so.» This neglect is chargeable partly to our homes, whose prevailing music is still of a cheap and vulgar character and where music-making is rarely pursued as a family function, and partly to our schools, where musical education is still apt to be considered as an extra subject for the talented few rather than as the rightful heritage of the many. That the other fine arts fare no better in this respect does not, of course, improve the musical situation in the least.

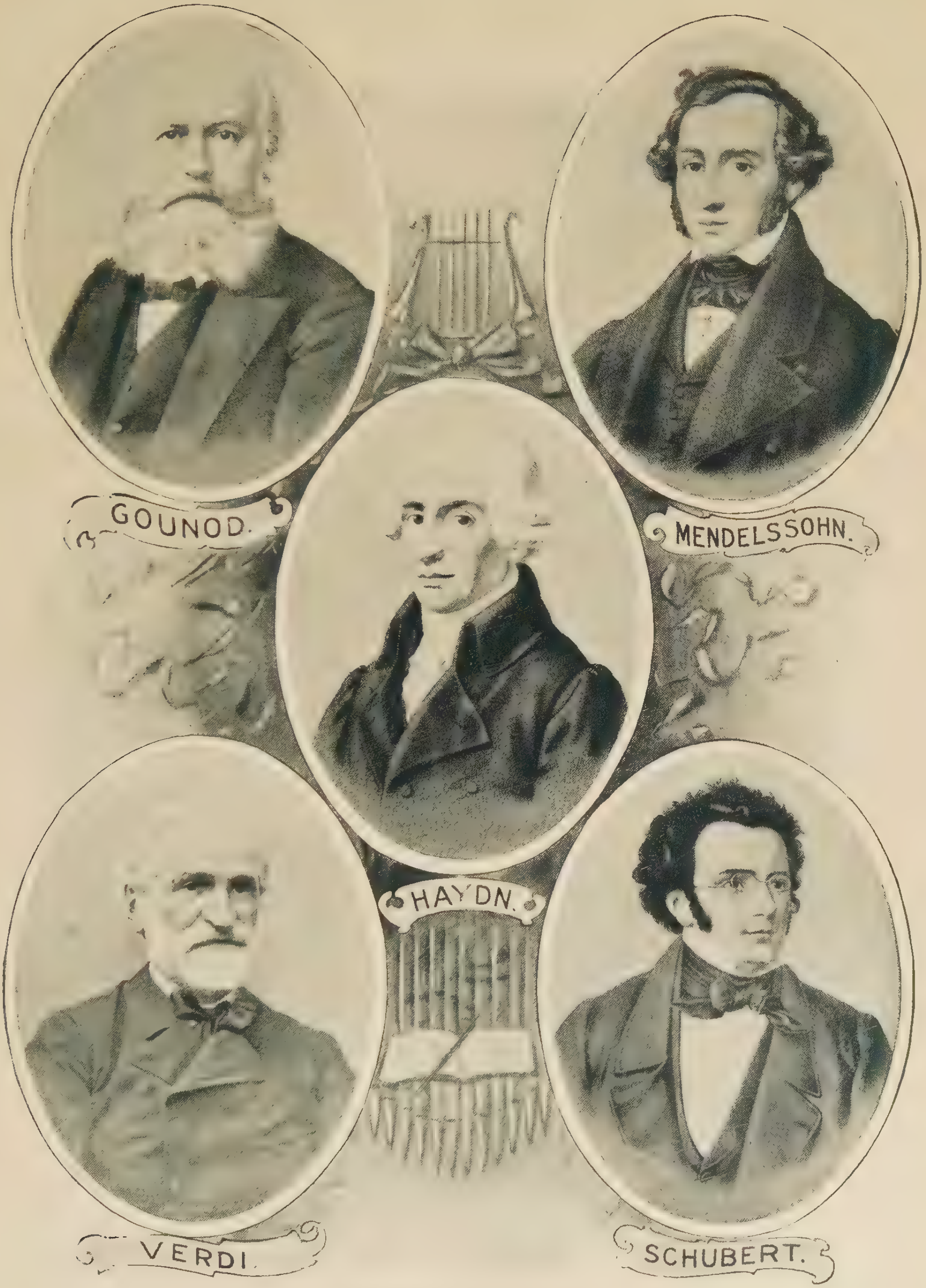
Just because music is, as already stated, the only art-form accessible to very young children, neglect to cultivate it properly in the home is far more irremediable than is the case with any other art. Yet, how rare is the American home in which music-making is pursued as a family function or in which children may naturally acquire a love for musical art. Even in intelligent homes — and intelligence in other departments of art does not necessarily argue musical understanding or appreciation — music is still regarded too much in the light of a fashionable accomplishment, and not as an indispensable part of a thorough education.

If children are to grow up with any greater fondness and appreciation for music than the average adult manifests — a desultory liking, at best — there must be a fuller realization among parents and educators of the need for proper musical education. In other words, until parents come to understand the true mission of music and afford their children adequate means for its realization, no real progress can be made in this direction. «The matter cannot be safely left to the schools,» says Mr. Surette, «as at present constituted.» It is the home, therefore, that must radically change its attitude toward art in general and music in particular, if the present generation of music-tasters is to be succeeded by a new generation of true music-lovers.

Ways of Promoting a Child's Musical Development.— Coming now to the consideration of ways and means by which the musical education of children may best be promoted, it must be said at the outset that environment and example play a far greater part than precept and instruction. That much music and morals have in common. Musical homes are the greatest promoters of a child's musical development, while unmusical parents are apt to be its greatest hindrance. In general, it is as wise to expect music-loving children in unmusical homes as tropical fruit in the frigid zone. But as most children are potentially musical, developing a child's musical taste and understanding is a question of allowing this potentiality to be realized — that is, of supplying the proper objective and subjective stimuli.

«The surest and most rational method of teaching children to know and to like music,» says Thomas Whitney Surette, «is through personal experience and contact with good music.» This can be done in at least three ways: (1) By singing and hearing beautiful songs, which train the ear and cultivate good musical taste; (2) by learning to play good music on some standard instrument, which gives one a deeper insight into musical form and structure; and (3) by cultivating the art of intelligent listening, which enlarges one's musical understanding and familiarizes him with musical literature. In other words, the three specific aids to musical development are — *singing, playing* and *intelligent listening*. We shall consider each of them in the order given.

(1) Just as musical educators insist that a child's musical education should begin in the cradle, they keep on reiterating that singing is the best means for this early training. A mother's sweet lullaby is the time-honored and unexcelled child's song-primer. «The baby should hear soft, melodious, correct singing every day,» says Dr. Frank Damrosch. «If the parent cannot supply this, so much the worse for both parent and child. The next best thing is to get a nurse who can sing nursery songs correctly. It is as important as any other qualification necessary for the proper care of the child. The singing of good, simple songs to children in their earliest years is one of the most valuable means for inducing not only a correct musical ear, but also a love for music as such. A child brought up in this way will never be tone-deaf, and will probably sing before it can talk — certainly long before it learns to talk correctly.» That singing is the only rational foundation for a child's musical education is the opinion of every prominent musical educator. «Singing by ear spontaneously and without technical instruction, but rather for the joy of doing it, and for the formation of taste on good models,» writes another eminent musical authority, «is the proper beginning of all musical education.» Singing beautiful songs is not only the best preparation for an intelligent understanding of the masterworks of musical literature, but a positive joy in itself, a supreme joy to every normal child. «The joy which a child gets in reproducing beautiful melodies,» this writer points out, «is like no other experience in life. In the process of doing so, its whole being — body, mind, heart and soul — is engaged. The song, for the moment, *is* the child. There is no possible realization of the little personality comparable to this. . . . Through this [singing] children can feel a beauty and order and se-



CELEBRATED MUSICIANS

quence which their minds are incapable of grasping.» Hence, whatever instrument a child is to take up later, the first essential is to learn to sing songs intelligently and for the joy of the thing.

As young children are so impressionable and their memories so tenacious, their songs cannot be chosen with too much care. The cheap artificial vulgarities that pass by the name of music — those coarse, unimaginative conglomerations in which rhythmic excitement is the common substitute for musical ideas — must be as rigidly excluded from our homes as are foul air and tainted food. The effect of the former may be less apparent or immediate, but it is just as pernicious and more irretrievable. «Artificial and false methods,» says Mr. Surette, «are less harmful to children than the poor, vapid and false songs by means of which the taste is slowly and surely disintegrated.» On the other hand, the influence of good songs is even more indelible. «In all the reminiscences of days gone by,» wrote Phillips Brooks, «there is nothing that so haunts the spirit as the songs to which we were accustomed in childhood.» Yet, the great majority of parents — parents who may be deeply concerned over the cut of their children's clothes and the style of their shoes — do not give a moment's thought to the kind of songs their children are singing. Certainly, children's music deserves as much attention as their manners or morals; and the task of selection or exclusion is a comparatively easy one, if begun early enough, since most children whose ears have not been debauched by abominable «rags» instinctively prefer good songs. That much musical taste seems to be theirs as part of their natural endowment. So much the greater is the parental crime in allowing it to become debased.

For the first stage of a child's musical education, which should be as spontaneous and as informal as possible, the traditional folk-song affords abundant and most appropriate material. «Folk-song,» writes a distinguished musical authority, «was the beginning of what we call 'melody,' and the best specimens of it are quite as perfect within their small range as are the greatest works of the masters.» Its simple but beautiful melodies, the common heritage of the ages, are musically invaluable both as a means and as an end. As a means, they prepare children for an intelligent appreciation of the compositions of the great music masters, which, according to some musical educators, many adults deprived of such preparation can never attain to. How great is the debt of these musical masterpieces to the old folk-songs and dance tunes may be judged from the fact that even the symphony, the highest and purest form of music, pays its everlasting tribute to their melodic fertility and rhythmic diversity.

But this educational value of folk-songs, great as it is, would hardly justify their exclusive use with children if their own charms were insufficient, since nothing so effectually kills musical interest in young children as dull, non-pleasurable singing exercises. It is as an end in itself, and not as a means to some other end, that the singing of folk-songs, folk-ballads, and folk dance tunes makes so strong an appeal to both young and old. «Whatever has at any time appealed to the best emotions and moved the hearts of a people,» says Dr. Claxton, Chief of the United States Bureau of Education, «must have for their children and their children's children political, historical and cultural value. This is especially true of folk-tales and folk-songs.» Thus, while cultivating good musical taste and storing up musical melodies to be recognized as old acquaintances later, these folk-tunes establish most enduring ties between the generations of men.

(2) If a child's songs have been wisely chosen from infancy and his singing has been made a pleasurable experience to him, he should show by the time he is seven whether he is really musical or not. In the latter case, the informal period of musical training has been no loss, but a clear gain to the child; in the former eventuality it has been a most rational preparation for the second period — the more formal one — which is to involve one or another of the standard musical instruments.

The choice of a musical instrument should never be haphazard; it must be made very carefully and intelligently, and always with full regard to the particular aptitudes and powers of the learner. Musical educators greatly deplore our unfortunate custom of selecting instruments regardless of their fitness for the individual child who is to learn to play upon them. Says one of them: «The majority of the children who have private instruction in music take lessons in pianoforte playing» because «it has become a custom; the pianoforte is an article of domestic furniture; pianoforte playing is a sort of polish to a cursory education. . . . It is the line of least resistance; there are plenty of teachers of pianoforte playing, but few teachers of music, so parents accept that which is available.» Parents who have the best musical interests of their children at heart will do well to consult some reputable, disinterested musical educator as to the choice of an instrument. In view of the deplorable vogue of the piano and the even more deplorable dearth of intelligent piano players, this costly and ponderous instrument should be viewed with special suspicion. Its indiscriminate choice is said to end fatally for nine-tenths of our music pupils, pupils whose painful fingering leaves them nothing but a sad memory of much valuable time needlessly wasted. Everything else being equal, therefore, almost any standard musical instrument would seem to be preferable to the piano for non-professional purposes. The latter should be chosen «only when a child possesses a certain amount of that physical coordination which is absolutely essential to playing the pianoforte.» In the interest of chamber music, a most excellent aid to amateur music study, preference might well be given to the violin or the violoncello. Certainly in homes really musical such variety will be sought as will promote the cultivation of chamber music. If such musical foresight were more common, our children would pursue music with greater enthusiasm and profit; while our family circles could become intimately acquainted with the masterpieces of sonata literature which are now a closed book to them. With such convenient and inexpensive means for building up correct musical taste in our very homes, so-called unmusical children would become as rare as unmusical parents are now common. Only then might we all cease worshiping mere virtuosity or technique and learn to love music for its own sake. Only then shall gross incapacity to appreciate music be classed with other forms of ignorance as being equally discreditable.

As to the age at which a child is to begin formal music study opinions differ. An authority already quoted in this article thinks seven the earliest age; another (Albert Lovignac) makes six the lowest limit; while others place it anywhere from five to 10. «I shall never advise allowing a child that is not to be exhibited as a phenomenon at shows and circuses,» writes Professor Lovignac, «to study any musical instrument whatever before the age of six *at the earliest.*» Of course, it is not a child's age that should be considered, but his musical readiness and responsiveness. Only when a child has gone through the singing stage of musical development — that is, when a child has been singing beautiful songs for several years and has had his musical instincts developed thereby — is he ready to take up instrumental music with pleasure and profit. «I question the wisdom,» says Mr. Surette, «of forcing children to play who are not qualified to do so; and I think playing should, in any case, be postponed until the musical faculties are awakened by singing.» Before this awakening comes, no real musical education is possible — and the sooner parents and teachers recognize this fact, the better for all concerned. «A great deal of nonsense is talked nowadays,» says a writer on the human side of music, «about the necessity for taking the fingers when they are young and supple. I believe that, generally speaking, they are quite as young and supple as is necessary at fourteen or fifteen; and that a single hour of practice, reinforced by the enthusiasm of one who has his eyes fixed on the enchanted castle — the lure of chamber music parties and amateur symphony orchestras — is worth fifty hours of forced and grudging grind. . . . A large amount of needless indifference to good music and even active hatred for it is caused by putting children at dry piano scales and Czerny-with-the metronome before ever they have developed a single spark of enthusiasm for the classic beauty to which the excellent Czerny is such an obvious and supple finger-post. To do this is to teach them to regard the choicest portions of musical literature as all of a piece with the literature of the spelling-book.»

Not less important perhaps than the choice of an instrument is the selection of a music teacher. Elsewhere in this article an authoritative opinion was cited as to the sad state of present-day music teaching. In view of this, parents should exercise special caution in engaging music teachers for their children. Without much circumspection in this regard they are more likely to encounter the incompetent instructor, who blights a child's love for music, than the real music master who encourages and promotes its growth. The harm done by mediocre music teachers — teachers who understand neither their art nor the child they undertake to teach — is both positive and negative. Their employment is absolutely inexcusable and never fails to lead to remorse and disappointment on the part of those misguided parents who share the fallacy that any kind of teacher will do for musical beginners. The fact is that the best teacher is none too good for the earlier stages of music study, for «cheap teachers» may lay such a faulty and insecure foundation as will make all future musical progress well-nigh impossible. In other words, they prove a most wasteful economy and must be studiously avoided by every well-intentioned parent and guardian.

In order that such may know what the qualifications of a good music teacher are, the following summary (from Dr. Frank Damrosch's 'Some Essentials in the Teaching of Music') is here appended in full. «He must be a person of culture and good breeding; a good musician, able to play with ample technical skill, accuracy, intelligence and taste; thoroughly grounded in the history of music; equipped with a wide knowledge of musical literature and acquainted with the standard compositions in every field of musical art; and, finally, he must have high art ideals and be able to arouse and maintain them in his pupils.» And, it should be added, the more such a man knows about the other arts, about the science of education and about the psychology of childhood, the better a music teacher he will make. Unless parents can provide such private instruction in music as these qualifications promise, the musical education of their children were better entrusted to a reputable school or conservatory, where the professional standards are apt to be above those prevalent among private music teachers, with their proneness to overindulge the whims and tastes of their unmusical employers.

With good musical instruction — instruction that places greater emphasis on appreciation than on execution — and with parents intelligent enough not to clamor for tangible and quick results — results measured by mechanically acquired repertoires — the child's musical education is most auspiciously begun. Even though the child does not acquire a wonderful technique, it will be sure to acquire that which transcends in value all mere dexterity — real understanding of music itself. Even if a child acquires but the ability to read music at sight, it gets an educational advantage comparable to the ability to read verbal language, an advantage which means an open door to the world's musical literature. But under proper encouragement and intelligent guidance, even children who may not be destined to become good musicians will grow up to be true music lovers, a far greater attainment, as we shall see presently, and one really worth striving for.

(3) Whether a child pursues his musical studies in the instrumental field or not, his musical appreciation should go on developing through intelligent listening. The latter is certainly as good a means for developing one's musical faculty as drawing a bow or manipulating a keyboard. Indeed, it is owing to our unfortunate emphasis on «executive ability» as the sole test of musicality that there are far more performers than real music-lovers in the world. But until this emphasis is shifted from performing music to its appreciation, the progress of music education can have no firm basis. Music, as the noblest of the arts, must never be confused with mere titillation of the ear and finger gymnastics; and any view of music is erroneous which places technical dexterity — at best a means to

an end — above the end it is to serve. «Pieces well played,» the everlasting desideratum of parents, may be more tangible results of music study than appreciative listening, but the latter is a surer and more permanent means to lifelong musical enjoyment. «The capacity properly to listen to music,» says H. E. Krehbiel, dean of American musical critics, «is better proof of musical talent in the listener than skill to play upon an instrument or ability to sing acceptably when unaccompanied by that capacity. It makes more for that gentleness and refinement of emotion, thought and action which in the highest sense of the term it is the province of music to promote. And it is a much rarer accomplishment.» Moreover, it should be remembered that not all can be performers of music. «Distaste or inability in the matter of learning to play the piano,» says Professor Macpherson, «is hardly to be regarded as a proof either of an unmusical nature or of a dislike for music. . . . In the case of literature, we should not go to the length of depriving children of good books if they were to prove themselves unable to recite, or unfit to write verses; why, then, starve them musically simply because, from comparable reasons, they prove themselves unable to reproduce with any degree of success the *musical* literature on the piano? . . . I am convinced that we shall never create a community of really intelligent listeners until we realize that their training should consist of something more than the abortive struggles at the keyboard, which at present too often pass as musical education in many schools and private families.»

Every child, therefore, should be given frequent opportunities to hear good music, vocal and instrumental. This course alone, consistently and judiciously pursued, might make the younger generation more musical; for «being musical,» it should be remembered, «does not necessarily lie in performing music, but is a *state* of being which every individual who can hear is entitled by nature to attain to in a greater or less degree.» While a theoretical knowledge of music undoubtedly enhances one's pleasure in listening to it, such knowledge is no more essential to real musical enjoyment than the ability to perform. Just as exquisite enjoyment may be experienced in viewing a beautiful landscape without any knowledge of botany or geology, so great pleasure may be derived from hearing the world's musical masterpieces without any technical knowledge of their structure or form. Yet, true musical appreciation is not passive, like simple sensations, but calls for active co-operation on the part of the listener. «Music,» says Prof. Dickinson, «like all fine art, demands an active exercise of the will, as well as a sensitiveness to physical elements and a vague response to suggestion. . . . An earnest mind cannot be satisfied with a pleasure, however pure and elevating, that quickly dissolves, leaving no residue to be worked over by the memory.»

Musical appreciation can and should be cultivated from earliest childhood. The need for such special cultivation arises from the well-known fact that every art requires habituation to its peculiar language, forms and lines of excellence. Repeated impressions and frequent associations are the indispensable conditions for the study of all art. «Just as one cannot take in at a glance the artistic beauties of a Whistler portrait or the linguistic beauties of a Miltonic poem,» says Mr. Surette, «so one needs constant experience in hearing music to learn to appreciate all the melodic depth and inventiveness of the works of Brahms, Bach and Beethoven.»

Like the drama, music has been too much regarded as a pastime — too much as our diversion rather than as our spiritual salvation — even among intelligent listeners. Therefore, whatever else children learn about music, they must learn to regard it an art that is far above mere recreation and amusement; as an art that appeals to the intellect as well as to the emotions; as an art whose pleasureableness grows upon one with the degree of serious attention he brings to it; and, finally, as an art the proper understanding of which is just as great a mental achievement as an understanding of the higher forms of literature or the abstract sciences — certainly a far higher achievement than learning to play an instrument without distinction or to sing without musical taste.

But musical appreciation grows slowly; it cannot and must not be forced. Children should be allowed to absorb the best music unconsciously at first. They should not be expected to appreciate compositions that are far beyond their stage of musical development. Cramming a Beethoven symphony into a young child's ears is just as judicious as cramming Miltonic poetry down his throat. Both must bide their time. Although children can grasp and æsthetically comprehend music far beyond their ability to perform, there are, of course, obvious limits which wise parents and teachers will do well to bear in mind. But, unless children are forced in their musical education, there is no danger in their hearing musical compositions that transcend their understanding. If a child is musical, much of this musical experience will bear fruit later; if not, no harm can come of this premature exposure to its elevating influence.

The non-technical means and objects, then, of musical education for children are — to sum up in the words of another — «observation, discrimination, reflection; cultivating the memory for musical phrases and melodies, disciplining the senses, enlarging the scope of the imagination, and nurturing the sense of beauty. By such a process we attain in some measure to that joy which is one of the chief objects of art in general and of good music in particular.»

Bibliography.— Owing to the dearth of literature bearing directly on this subject, a few magazine articles, entered alphabetically under the names of the periodicals, are included in the following list of references: *Atlantic Monthly,* ‹Children's Music› (March 1916); Britan, ‹The Educational Value of Music› in ‹The Philosophy of Music› (New York 1911); Brower, ‹Home Help in Music Study› (ib. 1918); *Craftsman,* ‹Music and Our Children› (October 1915); Damrosch, ‹Some Essentials in the Teaching of Music› (New York 1916); *Delineator,* ‹Giving the Children an Ear› (October 1911); Dickinson, ‹The Education of a Music Lover› (New York 1911) and ‹Music and the Higher Education› (ib. 1915); *Education,* ‹The Cultural Value of Music› (November 1911); Farnsworth, ‘Education Through Music’ (New York 1909); *Journal of Pedagogy*, ‘The Musical Interests of Children’ (October 1898); Krehbiel, ‘How to Listen to Music’ (New York 1906); Lavignac, ‘Musical Education’ (Singleton's translation, ib. 1903); Macpherson, ‘The Musical Education of the Child’ (Boston 1916); Mills, ‘The Study of Music as a Means of Education’ in ‘Music and Education’ (London 1905); *Monthly Musical Record*, ‘The Children and their Music’ (August 1916); *Musical Leader*, ‘Music as Part of a Child's Education (May 6, 1915); Patterson, ‘How to Listen to an Orchestra’ (London 1913); *Proceedings of the National Education Association*, ‘Musical Appreciation — How it is to be Developed’ (1912); Schauffler, ‘The Musical Amateur — A Book on the Human Side of Music’ (Boston and New York 1911); and Surette and Mason, ‘The Appreciation of Music’ (New York 1907).

David A. Modell.

MUSIC, Education in. The question as to the effect of music on the moral life and character of the individual is one which has been discussed from time immemorial, but regarding which no definite conclusions have yet been reached. The Greeks had an exalted opinion of the art in this respect: it had wonderful powers of molding the nature of man, far beyond anything to be observed to-day. Consequently it played an important part in their scheme of education. But Greek music, we must remember, included poetry and dancing, and thus occupied a position of eminence which would not have been warranted by the exercise of mere tonal art. Furthermore, the scales of Greek music were intimately connected with certain fixed aspects of life. One, for example, was used for martial and patriotic purposes, another for religious ceremonies, and a third again for the expression of feelings of love. Thus the scales became imbued with a power and significance which were not their own, but were drawn from the circumstances with which they were associated.

In more recent times the eulogy of music has been less pronounced, yet the art is still heralded as a positive moral and educational agent. Luther was emphatic in his praise of it, and advocated its employment in the training of youth. Herbert Spencer taught that it had the function of developing the emotional element of speech, and since speech is a means of arousing feelings in others, of enhancing sympathy. According to Mr. Haweis it is an efficacious method of exercising and disciplining the emotions. Opposed to these views, however, we have the opinions of other thinkers who doubt the moral value of music, or even regard its effects as deleterious. Edmund Gurney denies any direct effects at all, though he makes full allowance for the indirect. Hanslick grants a certain elemental power over the emotions, but insists that this stands in inverse ratio to the individual's culture. Tolstoi seems to detect an influence for evil rather than good; while William James, though not referring especially to music, shows how the frequent evaporation of emotions without results in conduct,— and this characterizes many musical emotions,— produces a tendency toward evaporation in general, and so weakens the moral fibre.

In explanation of the divergences of opinion it may be pointed out that there are temporary and permanent effects to be considered. There is no doubt that music can produce momentary expansions and elevations of spirit — and it may be that these were held in mind by its champions — but it by no means follows that such ebullitions are of lasting value. Indeed, it is even possible, according to James, for good emotions to work harm if they do not issue in corresponding actions. Then again, as already indicated, there may be differences of opinion according as one considers the art in its narrower sense or includes the circumstances with which it is associated. A succession of tones by itself may not be good or bad, but the words, dancing and general circumstances in connection with which it is heard may be good or bad, and their moral quality may be transferred to the tones themselves.

This is not the place to go into the details of the arguments which seek to establish the moral quality of music. It must be confessed, however, that many of these arguments are of a vague and general character, and are more convincing as evidences of the fervor and enthusiasm behind them than as demonstrations of the propositions which they seek to establish. To speak in eloquent words about beauty and harmony, as if the mere hearing of a major triad were sufficient to bring peace into a man's troubled spirit, is little more than a rhetorical flourish. It is a case where the proverb about cup and lip is decidedly applicable. As well try to prove that the constant exhibition on the stage of the dire results of sexual immorality will engender chastity among actors. A mere reference to the life of the foremost composer serves as a refutation of such lines of proof. For though Beethoven's career may have been picturesque and heroic, it was certainly the opposite of harmonious both subjectively and socially.

A rational way of approaching the problem is the empirical one of recourse to experience. We may ask: are the musical nations and individuals superior to the unmusical? The reply must certainly be in the negative. The Italians, Germans and Slavs are musical, the French less so, and the English rather unmusical, yet there is no corresponding agreement in the scale of ethical valuation. Likewise there is no correspondence between the moral value of individuals and their taste for the art of tones. People with no musical ear whatever may be upright and reliable, people who are susceptible to the art given to weaknesses and vice. The situations are complicated, to be sure, and there may be antagonistic influences which obscure the action of music, but in the absence of proof that this is so we are compelled to say that the facts do not favor the assumption of a definite and pronounced effect like that in question.

We must conclude, accordingly, that the proposition regarding a directly moral or educative effect of music is still lacking demonstration; indeed, the evidence that we have seems rather to be of a negative character. But this does not apply with the same force to the indirect effects, or detract from the total value of the art. To begin with, music affords a pure and high species of pleasure. And why should this not be sufficient? Do we expect the rose to teach us a moral before being legitimized, or the clouds to deliver a sermon? Pleasure may not exhaust the meaning of existence, as the utilitarians would have us believe, but it subserves a highly important function in the scheme of creation. Its anticipation by the individual is one of the chief incentives toward action, and its actual enjoyment of the greatest importance as a relief from toil and fatigue. Furthermore, since pleasure will and must be enjoyed, any exercise of it in pure and refined forms — as in music — ought to be welcomed, taking the place, as it does, of the more noxious kinds of enjoyment into which people are constantly tending to fall. Here the recourse to experience may be of help. The English may not be inferior to other peoples in a profound ethical sense, as indicated, but they are notoriously given to intemperance, while on the other hand they are emotionally somewhat too sober. Is it unreasonable to suppose that these conditions would be remedied if, like continental peoples, they took more interest in music and art? In addition to producing pleasure, music serves as a framework and beautifier of social activities. It embellishes the play, dignifies the commencement exercises, graces the household meeting of friends, lends emotional power to the worship of God. This influence may at times acquire considerable importance. Of Luther, indeed, it was said that he won as many adherents through his chorals as through his religious teachings. Finally, where immediate rather than remote effects are desired, as in the onward rush of battle, music may even produce direct dynamic results of great power.

So then, there is enough reason for the cultivation and teaching of this art, even without the direct effects of which we have spoken. Music is and will remain an important element in the life of the individual and community. Nor will the phonograph, wonderful though it is, ever quite replace its personal exercise. We shall always require artists to create new records; there is a pleasure flowing from actual singing and playing that is unique; and the social effects of co-operation in the rendition of pieces can likewise be obtained in no other way. Indeed, to judge from the outlook at present, music is going to gain in recognition rather than lose. Provisions are being made for its cultivation on a scale more extensive than ever before. In the past, public instruction has been confined largely to singing in class. And this, in fact, may be the best way to arouse that sympathetic glow of feeling which it is a function of the art to foster. But higher attainments of course demand individual instruction. Hitherto this has been gained chiefly through outside lessons, or, in the case of prospective musicians, conservatories of music. Both of these methods have disadvantages. In the conservatories there is practically no education apart from music, to the disadvantage of general culture. And with the outside lessons there is too little incentive for the rigid prosecution of music itself. As the work in school is supposed to fill the child's time, it follows that he has no energy left for extra studies. Or if he attempts to do justice both to his school work and his lessons, it is the health which is likely to suffer. Under the circumstances the rational thing to do is to make provision for music in the school curriculum itself, even when taken outside of school hours, and allow it to count toward graduation. And this, in fact, is beginning to be done. Several cities of our country have already adopted the plan suggested, it has the sanction of prominent educators, and there seems but little doubt that it will spread until it has become universally established. The result will be a great impetus toward the cultivation of the art. Those who possess talent in this direction will have time and opportunity to develop their powers. Music will no longer be considered as a mere accessory in the education of youth, but will take its place in worthy co-ordination by the side of all those other studies that go to the fashioning of educated men and women.

ALBERT GEHRING.
Author of 'The Appreciation of Music,' etc.

MUSIC, The Psychology of. Psychology as applied to music can be considered from the point of view of the listener, the performer and the composer.

I. So far as the listener is concerned, the object of the science is to give a thorough analysis of the process involved in hearing music, and account for the accompanying pleasure. Beginning with the impact of the sound waves on the ear, it must be shown in the first place how that organ is physically affected. The elementary conscious effects must then be elucidated, whereupon associative relations will be traced, and higher intellectual and emotional reverberations accounted for. Such a treatment, to be sure, is at present a mere desideratum toward which we are moving, but the complete realization of which is still a long way off.

Only in regard to the first stages of the process have we reached anything like fairly satisfactory insight. Helmholtz's great work on *Sensations of Tone*, while perhaps not final in every particular, has established certain acoustic facts which are fundamental and will always remain as a basis of musical æsthetics. In general, Helmholtz's treatise deals with the subject of partial tones, combinational tones and beats. Partials, he has shown, accompany most tones of a musical character, and are the source of their differences of timbre. Dissonances are explained as the result of rapid beats, while consonances owe their purity of sound to their comparative freedom from the same. Minor chords are accompanied by combinational tones that are foreign to the harmony, and hence produce a veiled, mysterious effect. The relative harmoniousness of different chord positions is also dependent on the absence or presence of foreign elements. Many other propositions receive elucidation from Helmholtz, but the reader who would learn about them is referred to his classic work itself or the well-known translation of the same by Ellis.

The higher and more psychical reaches of the matter have been approached with considerable skill by various writers, although the results are by no means as clear and incontrovertible as the more elementary ones of Helmholtz. Among the valuable dissertations to be mentioned are Gurney's *Power of Sound*, Stumpf's *Tonpsychologie*, and an essay in

Lazarus' *Leben der Seele* entitled *Die Wirkung der Musik*.

A central problem of musical psychology and æsthetics is that of accounting for the pleasure derived from the art. Among the theories that have been invoked for this purpose, two of the best known, though they likewise belong to the most untenable, are those of Darwin and Spencer.

According to Darwin, music is the result of sexual selection. Those of our pre-human ancestors who could sing best were chosen as mates by the opposite sex. The emotions of love, rivalry and combat incident to the breeding season were thus associatively welded to the perception of tones, so that we, in listening to music, have called up «vaguely and indefinitely the strong emotions of a long-past age.»

According to Spencer, on the other hand, the art owes its stirring power to its suggestions of excited and emotional speech. The cadences of music are an intensification of those of language, and arouse the corresponding emotions in exaggerated form.

Later writers on the subject have for the most part either ignored these theories or cast them aside. And it must be admitted that they do not take account of the vast complexity of the subject with which they deal, nor afford much in the way of positive proof.

There is no doubt, for example, that the pleasure we derive from the art is due to a variety of causes. These may be reduced to five: the elementary power of tone, form, association, symbolization and sympathetic agitation through parallelism of tonal process. All of these contribute to the final result. There is an effect of tones which is purely physiological in nature, and insusceptible of further analysis. Structural beauties are a source of distinct delight, especially in compositions of an elaborate character. Associations are involved, symbolizations play their part, and there are numerous points of resemblance between the flow of tones and the flow of thought and feeling. It would seem, however — and here Darwin and Spencer may be right — as if the peculiarly unique and intense enjoyment afforded by music when it thrills us to the core must likewise be due to a unique cause, or it may be unique combination of causes. What this is has so far not been satisfactorily explained. However, the most promising suggestions are those which have been offered by the «symbolistic» and «parallelistic» theories. The theory of Schopenhauer is fascinating and in some respects highly plausible, but it is metaphysical in nature and so does not fall within the scope of the present article.

A further problem, from the point of view of the listener, is that of the moral effect of music on the individual, which would branch out into the broader questions of its social effects and its place in the life of the community. The question why some people are susceptible to emotional stirring by tones, while others are callous, is an interesting branch of the general problem of musical enjoyment, which likewise has not yet received a satisfactory solution.

II. From the point of view of the performer the task of psychology is to describe accurately the physical and mental processes operative in the rendition of compositions; more especially the easiest and most effective processes by which the desired results may be achieved. The practical benefit of such knowledge would lie in its help to musical pedagogy. With adequate insight of this kind it would be possible to show wherein the numerous «methods» are both valuable and faulty, and prescribe the best method for any particular case.

A psychology of «learning,» applied to music, would elucidate the quickest and most effective means of mastering particular compositions and attaining general proficiency. Tests would also be valuable as aids in the work of the teacher. With their assistance it would be possible to determine on the spot whether a student had talent or not; likewise what his weak and strong points were, and what kind of treatment he would accordingly require.

So far, not much has been done along these lines. The educational psychology of music has, for various reasons, lagged behind that of other branches of pedagogy, both in its theoretic results and the disposition made of these results. It is a rare thing for a prospective teacher to acquaint himself with the conclusions of psychological research; and to tell the truth, the material at his disposal is by no means ample.

III. The methods and habits of composers in creating their works furnish material for many interesting anecdotes, but these would gain scientific value only in case they yielded a better understanding of the laws governing musical inspiration in general, and thus enabled us to produce at will the conditions favorable for such inspiration.

Of greater general interest, at present, is the question of the manner in which a composition reflects the individuality of the composer, as well as the nationality to which he belongs and the age in which he lives. There must be exact marks by which the emotional qualities of a man can be detected in his works, and exact laws according to which a mood or permanent state of mind transmits itself into a composition and gives it a characteristic stamp. Likewise there must be a relation between the nature of a composition and the nationality and era of which it is the product. To a considerable degree such relations have been noted, and they belong to the most interesting facts of musical psychology. There is hardly a doubt, for example, that the rapid tempos of Haydn and Rossini are a reflection of the buoyant, sprightly nature of these men, while the slower and more massive progressions of Beethoven evince a heavier temperament. Similarly the sharp dissonances and syncopations of the latter composer must be an expression of his temperamental explosions and tragic moods. There are relations between the nature of a country's songs and its dances and inflections of speech, resemblances between the music of a period and the contemporaneous literature and art. But most of the foregoing correspondences are sporadic and fragmentary, and have not so far been systematized into general laws. Knowing the nature of a man, we can in many instances detect traces of that nature in his works, but we are not as yet able to reverse the procedure and draw a picture of the man on the basis merely of his compositions.

Another problem which up to the present has defied solution is that of the apparent incapacity of the feminine sex for the task of composition. There is hardly a more peculiar problem in the entire psychology of sex. The plea that woman has had no chance is not tenable, for the girls that study music far outnumber their masculine competitors. And yet, though there is no dearth of reproductive artists,— singers and instrumentalists,— there is not a single woman composer of primary importance. Literature has produced many famous novelists and poets, art has contributed several noted painters, but the domain of musical composition seems to be a field which has been all but untrodden by the members of the feminine sex.

The psychology of music, then, represents a realm of problems and mysteries. It is a region of beginnings rather than attainments. Some of the problems, bound up with the hidden and subconscious aspects of mentality, may be slow of solution, some perhaps may never be solved. Most promising are those which deal with the reproductive mastery of the art. The questions of pedagogy, indeed, are not so intricate but that a thorough analysis may be expected at a day which is not too remote. The advantages will be varied. There will be a sifting of the fit from the unfit. Those who obviously have no talent for performance will leave this task to their more favored brethren, and save their energies for congenial pursuits. The talented, on the other hand, will have their labors facilitated by an accurate methodology. There will be a saving of nervous wear and tear, and greater results will be achieved in a shorter time.

ALBERT GEHRING,
Author of 'The Appreciation of Music,' etc.

MUSIC-BOX. See MUSICAL INSTRUMENTS, MECHANICAL.

MUSICAL DRAMA. See DRAMA; MUSIC.

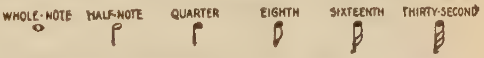
MUSICAL ELEMENTS AND TERMS. Music is the science or art which treats of tones produced by the mathematically regular vibrations of resonant bodies, in contradistinction to a confusion of irregular vibrations created by noise or a jumble of sounds.

Modern music, therefore, considered on its technical side depends upon a perfected system of mathematics and acoustics, evolved through centuries of gradual development, an evolution sketched in the historical and descriptive article on MUSIC in this work, to which refer, as also to GREEK MUSIC; MODE; MODULATION; TEMPERAMENT; WELL-TEMPERED CLAVIER, and related subjects.

By its manipulation of space and time in the process of development, the whole science of music has resolved itself into the mathematical measurement, combination and distribution of sound waves. Tones, considered simply as to their duration, are magnitudes of time, which stand in a descending geometrical progression the exponent of which is 2:1, ½, ¼, ⅛, 1⁄16, 1⁄32, etc. The time is expressible in fractions (2⁄2, 3⁄2, 4⁄4, ¾, 4⁄8, 6⁄4, 6⁄8, etc., time), which indicate in numbers how many parts of time (𝅝) are contained in each bar. In space, tones can be considered as magnitudes of sound, and their distances from each other in the scale are expressed in numbers, which have reference to a mathematical division of the space between two sounds, adopted as limits (the octave, the third, seventh, etc.). Similar proportions exist between the various voices, the soprano or treble, bass, etc., and between the various keys. In instrumental music, the depth and height of the tones depend upon the proportions of the thickness, length and lightness of the chords, the quality, diameter and distance of the openings in wind instruments and the like; and all these proportions are determined and measured according to mathematical rules. Middle C, shown in the scale farther on, has about 132 vibrations to the second, and is produced by sound waves from eight to nine feet apart. Waves at half that distance apart, produce a tone one octave higher, half that again the next higher octave, and so on. In large organs C four octaves below middle C, with 16½ vibrations per second, is reached, but the effect is imperfect. The piano reaches ^{a}4 with 3,520 vibrations per second, and sometimes ^{c}5, with 4,224 vibrations. The highest note taken in the orchestra is probably ^{a}5, on the piccolo, with 4,752 vibrations. The practical range in music is from 40 to 4,000 vibrations per second, embracing seven octaves. The human ear is, however, able to compass 11 octaves, that is, notes vibrations ranging from 16½ up to 38,000 in a single second of time.

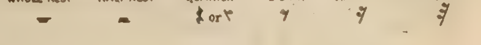
As may be gathered from the preceding paragraphs, the simplest form of musical sound is the Tone, distinguished by the three properties of *length, pitch* and *power.* These three properties constitute the elemental departments of music: RHYTHMICS, treating of the length of tones, the structure of phrases, sections and periods; MELODICS, treating of the pitch and succession of tones; and DYNAMICS, treating of the power or force of tones, and the manner or form of delivery.

Tones are represented by characters called Notes, named by some nations, including the English-speaking races, after the first letters of the alphabet, A, B, C, D, E, F, G; and, by Latin nations generally after syllables, as Do, Re, Mi, Fa, Sol. La, Si. Notes by their positions on the Staff of five lines give the pitch of the tones, and indicate their length by their form. The notes in common use are the



the names indicating the relative length of their tones. In modern music, the Whole-note, occupying all of an allotted amount of time, is regarded as the unit, although a character representing a tone twice as long as the Whole-note, and called a Breve or Double-note (𝅜) is sometimes used.

Rests,— characters used to indicate silence,— correspond in length of time to the notes which they represent, as indicated by their names:



A Dot placed after a note or rest increases the duration of either by one-half; two Dots increase by three-fourths, the second dot adding one-half the length of the first.

A curved line (⌒), called a Tie or Bind, placed over or under two notes of the same pitch, indicates that they represent a single tone equal to their united lengths; the curved line drawn over two or more notes which differ in pitch, is called a Slur, and indicates that these notes are to be sung or played legato, that is, smoothly and fluently.

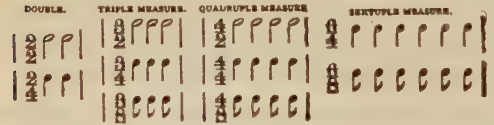
The Pause (𝄐) or Hold is placed over or under a note and indicates a prolongation of the sound according to the judgment of the performer.

Three equal notes may have their length diminished or reduced by placing the figure 3 above or below them; so marked they are termed Triplets, and their length equals two of the same kind.

To facilitate interpretation and performance, musical compositions are divided into short sections of equal duration called Measures and Parts — into measures by single bars and into parts by double bars. If a part is to be repeated, dots, called Repeating Dots, precede the double bar. (See characters at end of article).

The regular succession of these parts is called Meter, and this mathematical division of sounds by means of measures, metrical divisions and notes, is called Time. The time of each measure is the same as that of every other measure in the part and is determined by two figures, in the form of a fraction placed at the beginning of the piece, or at the beginning of a part. The Numerator of the fraction indicates the number of beat counts into which the measure is divided; the Denominator indicates the form of note which will represent the beat. Thus 6/8 shows that there are six beat counts in the measure and that an eighth-note will fill each beat.

According to the division of the Measure into parts, it is respectively called Double, Triple, Quadruple or Sextuple measure. Each kind of measure may have several varieties, according with the length of the notes expressed by the denominator of the fraction. For example:—



Accent — the life of Rhythm — is a stress given to certain parts of the measure. In Double and Triple measures, the first part is accented; in Quadruple measure, the first and third parts; in Sextuple measure, the first and fourth parts. In measures containing two accents, the first is the principal and stronger.

Rhythm, defined in its broadest application, is the swing and sweep of a musical composition, emphasized by the accents ringing out in their proper places, and attaining a series of climaxes in the special stress given to each metrical division of the work.

A Syncopated Note is one that begins on an unaccented part of a measure and continues on an unaccented part, giving the not unpleasant hiatus or jump to the rhythm, characteristic of much of the popular modern American music.

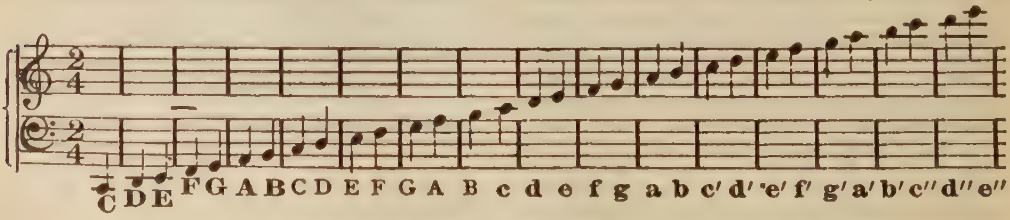
The length of the beats in each measure is indicated by certain Italian words, the chief of which are adagio, allegretto, allegro, andante, andantino, largo, larghetto, lento, moderato, presto, prestissimo, the definitions of which will be found in the table of musical terms incorporated with this article.

In the elemental department of MELODICS, the staff is used to represent the relative position and pitch of tones. The staff consists of five lines and four spaces, each line and space being called a degree. Added lines, called Ledger or Leger lines, are used to represent tones which are too high or too low to be represented upon the staff. They may be placed above and below the staff to any extent desired, as they are simply a continuation of the staff, the note immediately above or below the staff being in a space. The lines and spaces of the staff are named from the lowest upward, first line, first space, etc., the added lines and spaces above or below also being respectively enumerated first line above or first line below, etc.

Each degree or line and space is designated by one of the first seven letters of the alphabet, determined by the character of the Clef. The Clef is the character placed at the beginning of the staff to show how the letters are to be applied. The Clefs in common use are the G or treble clef marking the position of G on the second line of the staff, and the F or bass clef marking the position of F on the fourth line of the staff. In four-part songs, the soprano and alto are written in the treble, and the tenor and bass in the bass clef. The C on the first line below the treble staff, and the first C on the first line above the bass represent the same tone which is known as Middle C.

The staff as here represented embraces the compass of every singing voice, and extends over a range of 31 notes, or four and a quarter octaves.

Voices are usually considered under three divisions for the male: bass, baritone and tenor; and four for the female sex, contralto, alto, mezzo-soprano, and soprano. The usual range of the bass is from E below the bass clef (phenomenal voices sometimes descending to lowest C) ascending two octaves to f; baritone from G on first line of bass clef, two octaves


C D E F G A B C D E F G A B c d e f g a b c′ d′ e′ f′ g′ a′ b′ c″ d″ e″

to g; tenor, from C, two octaves to c′; contralto, the deepest female voice, from F to c″, or two and one-half octaves; alto, two octaves, from F to f; mezzo-soprano, from A to a′; and soprano from c (middle C) two octaves to c″, which is also indicated as c^2. Following natural and mathematical laws the tones of the female voice are an octave higher than those of the male, therefore a soprano solo sung by a tenor is rendered an octave lower than the notes in which it is written.

Besides the treble and bass clefs, others are used by certain orchestral instruments, as the alto clef for the viola, marking the position of C on the third line, and the tenor clef used for the trombone and marking the position of C on the fourth line.

The different vocal and instrumental parts are commonly represented by two or more staves, united by a Brace, and called a Score.

The Absolute Pitch of Tones, that is the pitch independent of scale relationship, is designated by the letters naming the degrees of the staff; as A, B, C, D, E, F, G. The position of these letters is fixed and unchangeable while the clef remains unchanged.

The difference of pitch between any two tones, as from A to B, from A to E, from C to G, etc., is called an Interval, and in the regular succession of the natural tones, there are two kinds of intervals, larger and smaller. The larger intervals are called Tones and the smaller semi-tones. In the major scale the semi-tones occur between the third and fourth notes and between the seventh and eighth notes, the other five notes of the scale representing each a tone. These two half-tones in the octave afford infinite variety in music. Were the eight natural sounds in the octave equidistant one from another, there being no semi-tones, the keys would differ only in acuteness and not in quality, as now. Between any two tones of the staff having the interval of a step, another tone may be inserted, dividing the step into two half-steps. These inserted tones are represented on the degrees of the staff by the aid of characters called Sharps and Flats. Thus, a tone inserted between C and D, is named C sharp, or D flat.

A Sharp ♯, placed on a degree, raises the pitch of a tone a half-step; a Flat, ♭, placed on it, lowers the pitch of a tone a half-step below that named by the letter. The power of a sharp or a flat may be canceled by a character called a Natural, ♮. A Double Sharp, 𝄪 is used on a degree affected by a sharp, to represent a tone a half-step above the one affected by the sharp; its power may be canceled by a sharp and natural, ♯♮. A Double Flat, ♭♭, is used on a degree affected by a flat, to represent a tone a half-step below the one affected by a flat; it may be canceled by a flat and natural ♭♮.

The Signature of a Staff is the part between the clef and the fraction; it is named from the number of sharps or flats which it contains, and indicates the key in which the composition is to be sung or performed. If there is no signature, the key is that of C or its relative minor A, and the notes correspond with the white keys of piano or organ. A sharp or flat in the signature applies not only to the degree on which it stands, but also to all others which represent the same pitch. A sharp, a flat or a natural, placed outside the signature, is called an Accidental, as appearing accidentally in the measure, and applies only to the degree on which it stands. If not canceled, its influence extends no farther than the measure in which it appears, except when the last note of a measure is flat or sharp, and the first note of the following measure is the same letter; then, if it is syncopated, the influence of the accidental extends to that note.

The Relative Pitch of Tones is indicated by a Scale, or Tone Ladder. The Diatonic Scale, generally called the Scale, consists of a regular succession of intervals from the key-note to the octave, 1st, 2d, 3d, 4th, 5th, 6th, 7th, 8th or octave, by a compromise called TEMPERAMENT (q.v.), it having been found most agreeable to join to the seven sounds of one group, the first of the next higher, making eight in all. The key-note is the first note in the scale. This scale is also called the Major scale to distinguish it from another scale, having its semi-tones in different order, and called the Minor scale. In the compass of the scale there are five whole tones or degrees, and two semi-tones or half-degrees. Commencing on C, that is making C one of the scale, these semi-tones are found between the third and fourth and seventh and eighth degrees and between the first and third degrees are found two whole tones, marking the distinctive feature of the «Major» or greater third. All music written on the scale when so constructed is said to be in the major keys; and this scale can only be formed from notes following this natural order. There is, however, another series of notes, equally well fitted for expressing musical ideas, which is formed by commencing on A instead of C or the equivalent note of any other Major key-tone. In this scale the semi-tones always fall between two and three and five and six, between the first and third degrees, there being not two whole tones, but only a tone and a half, making the «minor» or lesser third. All music written on a scale so constructed is said to be in the minor key, and is often most impressive. The Minor scale has various forms. In the Natural form as already shown, the half-steps occur between two and three, and five and six, and is formed from the Major Scale, by taking the last two notes above and placing them below. The Harmonic form differs from the Natural form by the introduction of sharp-seven. The Melodic form in ascending has sharp-six and sharp-seven, while it usually descends by the Natural form. The Minor scale, based upon six of the Major scale, is called its relative minor; and the Major scale, based upon three of the Minor scale, is called its relative major. The signature of a minor piece of music is the same as its relative major, the additional sharps or flats being introduced before the proper notes in the piece. Thus, a minor piece in the key of E has the signature of G major, that is F♯, and D♭ is used instead of D.

The key-note is One of the scale, and is called the Tonic. As already explained a minor third above the tonic characterizes the Minor scale; a major third, the Major. The Fifth of the scale is the Dominant; the Fourth, the Sub-Dominant. The key of a piece of music is the fundamental tone, or one of the scale in which it is written, and is indicated by the signature. The key of C has no signature. The other key signatures are G, one sharp — F♯; D, two sharps — F♯, C♯ A, three sharps — F♯; C♯, G♯; E, four sharps — F♯, C♯; G♯, D♯; B, five sharps — F♯, C♯, G♯, D♯, A♯; F♯, six sharps — F♯, C♯, G♯, D♯, A♯, E♯,; F, one flat — B♭; B♭, two flats — B♭, E♭; E♭, three flats — B♭, E♭, A♭; A♭, four flats — B♭, E♭, A♭, D♭; D♭, five flats — B♭, E♭, A♭, D♭, G♭; G♭, six flats — B♭, E♭, A♭, D♭, G♭, C♭. Notice that beginning with C the dominant or fifth note of each scale forms the tonic or key-note of the next scale, and thus interweaves the 11 scales into a completed circle.

An interval is the difference of pitch between any two notes in the scale. Unisons are of the same pitch. A major second consists of a step; a minor second of a half-step. A major third consists of two steps; a minor third of a step and a half-step. A perfect fourth consists of two steps and a half-step; an augmented fourth of three steps. A perfect fifth consists of three steps and a half-step; a diminished fifth of two steps and two half-steps. A perfect sixth consists of four steps and a half-step; a diminished sixth of three steps and two half-steps. A major seventh consists of five steps and a half-step; a minor seventh of four steps and two half steps. A perfect octave consists of five steps and two half-steps. These are called diatonic intervals, as they are all found in the diatonic scale. Other intervals, called chromatic intervals, may be formed by the use of sharps and flats. When the lower note of the two representing an interval is placed an octave higher, or the upper one an octave lower, the interval is said to be inverted. The degrees of an interval are counted upward, unless the opposite is stated; and the degrees occupied by the notes, as well as the ones between them, are counted.

The Chromatic Scale is a regular succession of semi-tones, the tones named from those of the diatonic scale or the letters of the staff, the intermediate ones taking their names from one or the other of the tones between which they occur, with the addition of the word «sharp» or «flat.» Thus the tone inserted between C and D, when named with respect to absolute pitch, is called C sharp or D flat; and with respect to relative pitch is called sharp one or flat two.

Passing Tones not essentially belonging to a melody are often introduced, and are usually represented by small notes.

A Chord is a pleasing combination of tones sounded together, and Harmony (q.v.) is a succession of chords, according to the rules of progression and modulation.

Dynamics or the power of tones and the manner or form of their delivery constitute the third elemental department of music. The power of tones is usually indicated by words, marks of expression, characters and abbreviations, mostly of Italian origin, affixed in the positions desired on the composition by composer, editor or technical interpreter.

The following alphabetical list includes the dynamic marks of expression, together with the terms which indicate the relative time movement of a composition, and certain other terms and phrases, commonly used in music. Important terms treated separately in this work, under their respective titles, are designated by the reference (see special article). Terms which are practically in anglicized form and self-explanatory are omitted.

A. (*It.*) — By, for, from, to, at, in.

Abbandone, Abbandono, con (*It.*) — With self-abandonment; despondingly.

A battuta (*It.*) — In strict or measured time.

A bene placito (*It.*) — At pleasure as to time.

Absatz (*Ger.*) — A section, cadence or phrase.

A capella (*It.*) — In the church style.

A capriccio (*It.*) — At will, agreeable to fancy.

Accellerando (*It.*) — With gradually increasing velocity of movement.

Accent.— (See special article).

Acciaccatura (*It.*) — A grace note forming a species of arpeggio.

Accidents or Accidentals.— Occasional sharps, flats and naturals, placed before notes in the course of a piece.

Accompaniment; Acoustics.— (See special articles).

Adagio (*It.*) — A very slow degree of movement, demanding much taste and expression in the performance.

Adagio assai or molto (*It.*) — Very slow and expressive.

Adagio cantabile e sostenuto (*It.*) — Very slow, singing and sustained.

Adagissimo (*It.*) — Extremely slow.

A deux (*Fr.*); A due (*It.*) — For two voices or instruments.

A deux temps (*Fr.*) — Two equal times or measure-notes in a bar, such as in the Valse a deux temps, with six steps to every two of the ordinary waltz.

Ad libitum (*Lat.*) — At will or discretion. This expression implies that the time of some particular passage is left to the pleasure of the performer; or that he is at liberty to introduce whatever embellishments his fancy may suggest.

Affettuoso, Affettuosamente, or con Affetto (*It.*) — With tenderness and pathos.

Afflizione, con (*It.*) — Sorrowfully, with affliction.

Affrettando, Affrettate (*It.*) — Accelerating, hurrying the time.

Agitato, con agitazione (*It.*) — With agitation, anxiously.

Al, All', Alla (*It.*) — To the, or occasionally, in the style of.

Allegremente (*It.*) — With quickness.

Allegro (*It.*) and derivatives.— (See special article).

All' improvista (*It.*) — Extemporaneously, without premeditation.

Al Segno, Al Seg., or the character 𝄋. signifies that the performer must return to a similar character in the course of the movement, and play from that place to the word Fine, or the mark over a double bar.

Alt, Alta (*It.*) — Higher; as Ottava Alta, an octave higher.

Altissimo (*It.*) — Extremely high as to pitch.

Alto (*It.*) — In vocal music indicates the counter-tenor or highest male voice. In instrumental music, it also indicates the tenor part.

Amabile (*It.*) — Amiably.

Amoroso, Amorevole, or con Amore (*It.*) — Affectionately, tenderly.

Andante (*It.*) — This term often modified, both as to time and style, by the addition of other words, broadly implies a movement somewhat slow and sedate, but in a gentle and soothing style.

Andantino (*It.*) — Somewhat slower than andante.

Animato, con Anima, Animoso (*It.*) — With animation; in a spirited manner.

Anleitung (*Ger.*) — An introduction, a term often occurring in the titles to German publications.

Anthem.— A composition in the sacred style, of English origin, the words of which are generally selected from the Psalms.

Antiphone.— Responses made by one part of the choir to another, or by the congregation to the priest.

A piacere; A piacimento (*It.*) — At the pleasure of the performer. (See *Ad libitum*).

Aplomb (*Fr.*) — Self-contained; steady; exactitude as to time.

Appassionato, Appassionamento (*It.*) — With intensity of feeling.

Appoggiatura (*It.*) — A grace note or note of embellishment which as a passing tone precedes an essential tone on an accented part of a measure.

A quatre mains (*Fr.*); A quatro mani (*It.*) — For four hands. A pianoforte duet.

Ardito (*It.*) — Boldly, energetically.

Aria (*It.*) — An air, or song. Arioso (*It.*) — In the style of an air; vocal, melodious.

Arpeggio (*It.*) — An imitation of the harp produced by playing the notes of a chord in rapid succession, instead of altogether.

Assai (*It.*) — Very, extremely.

A tempo.— In time.

Attacca, Attacca Subito (*It.*) — Attack suddenly or commence immediately.

Audace, con (*It.*) — With boldness.

A una corda (*It.*) — On one string.

A vista (*It.*) — At sight; A prima vista, at first sight. Bar; Barcarole; Bass; Beat.— (See special articles).

Begleitung (*Ger.*) — An accompaniment.

Bellicosamenti, Bellicoso (*It.*) — In martial, bellicose or warlike style.

Bellezza, con (*It.*) — With beauty of expression.

Ben (*It.*) — Well; as ben marcato, in well-marked time.

Bene placito (*It.*) — At will.

Bis (*Lat.*) — Twice; indicating that a passage, distinguished by a curve drawn over or under it, must be performed twice.

Bolero; Bravura (*It.*) — (See special articles).

Breve.— A note twice the length of the semi-breve or Whole Note, seldom used in modern music.

Brillante (*It.* and *Fr.*) — An expression indicating a showy and sparkling style of performance.

Brio, Brioso, con Brio (*It.*) — With fire, brilliancy and spirit.

Brise (*Fr.*) — Sprinkled, broken into an arpeggio, in treating of chords.

Buffo, Buffa (*It.*) — Comic; as opera buffa, a comic opera.

Cadence; Cadenza.— (See special articles).

Calando (*It.*) — Gradually diminishing in tone and quickness; becoming softer and slower by degrees.

Calcando (*It.*) — Pressing on, hurrying the time.

Calmato (*It.*) — With tranquility, repose.

Calore (*It.*) — With much warmth and animation.

Canon.— (See special article).

Cantabile (*It.*) — In a graceful and singing style.

Cantata; Canticle.— (See special articles).

Cantilena (*It.*) — The melody, air or principal part in any composition; generally the highest vocal part.

Cantor (*It.*) — A singer; (*Lat.*) A precentor. Cantoris — The name given to the north side of the cathedral, the left side facing the altar occupied by the cantor or precentor, and opposite to the side occupied by the decani, or dean and priests.

Cantus (*Lat.*) — A song, chant, or melody; Cantus Firmus, the plain-song or chant.

Canzonet.— (See special article).

Capella, alla (*It.*) — In the church style.

Capo (*It.*) — The head or beginning.

Capriccio; Capriccioso (*It.*) — In a fanciful, capricious style.

Carol; Cavatina; Chant; Choir; Chorale; Chromatics; Clef.— (See special articles).

Coda (*It.*) — A few bars added at the close of a composition, beyond its natural termination.

Col, Coll', Colla (*It.*) — With; as col arco, with the bow.

Colla Parte (*It.*) — Implies that the accompanist must follow the principal part in regard to time.

Commodo, Commodamente (*It.*) — Quietly, with composure.

Common Time; Con; Concerto; Concord; Counterpoint. — (See special articles).

Da Capo or D. C. (*It.*); Diapason; Diatonic; Dilettante; Discord; Dissonance; Dolce; Dominant — (See special articles).

Dal. (*It.*) — By: as Dal Segno, from the sign; a mark of repetition.

Decani (*Lat.*) — See Cantoris.

Deciso (*It.*) — With decision, boldly.

Decrescendo (*It.*) — Gradually decreasing in quantity of tone.

Delicatemente, Delicato.— Delicately; con delicatezza, with delicacy of expression.

Dextra (*Lat.*) — The right hand.

Diminuendo or Dim. (*It.*) — Diminish gradually the quantity or intensity of tone.

Divertimento (*It.*) — A short, light composition, written in a familiar and pleasing style.

Divoto (*It.*) — Devoutly, in a solemn style.

Elegamente; Elegante (*It.*) — With elegance.

Empfindung (*Ger.*) — Emotion, passion.

Energico, Con Energia or Energicamente (*It.*) — With energy.

Enharmonic.— (See special article).

Espressivo or con espressione (*It.*) — With expression.

Extravaganza.— (See special article).

Falsetto; Fandango; Fantasia; Fifths; Figured Bass; Fugue; Fundamental Bass.— (See special articles).

Forzando or Forz, or FZ.— Implies that the note is to be marked with particular emphasis or force.

Fretta, con (*It.*) — With speed; hastily.

Fuoco, con, Focoso (*It.*) — With fire, intense animation.

Galop; Gamut; Gavotte; Gregorian Chant.— (See special articles).

Gebunden (*Ger.*) — Tied or connected in regard to the style of playing or writing.

Giocosamente; Giocoso; Giojoso (*It.*) — Humorously; joyously; with sportiveness.

Giusto (*It.*) — In just and exact time.

Glee.— A composition for three or more voices, generally in a cheerful style.

Glissando, Glissicato (*It.*) — In a gliding manner.

Grandioso (*It.*) — In a grand and elevated style.

Grave (*It.*) — A very slow and solemn movement; also a deep, low pitch in the scale of sounds.

Graziosamente, Grazioso, or Con Grazia (*It.*) — In a flowing and graceful style.

Gusto, Gustoso, or Con Gusto (*It.*) — With taste, elegantly.

Harmonics; Harmony.— (See special articles).

Hauptsatz (*Ger.*) — The principal subject or theme.

Hauptstimme (*Ger.*) — A principal part.

Homophony.— In unison.

Imponente (*It.*) — Imposingly, haughtily.

Intermezzo (*It.*) — An interlude; intermediate, placed between two others.

Interval; Intoning; Inversion.— (See special articles).

Istesso (*It.*) — The same, as istesso tempo, the same time.

Key; Kyrie.— (See special articles).

Largo (*It.*) — A very slow and solemn degree of movement. Larghetto, slower than largo. Larghissimo, extremely slow.

Leading Note.— The seventh note of the scale of any key, when at the distance of a semi-tone below the key note.

Lebhaft (*Ger.*) — Lively.

Legato (*It.*) — In a smooth and connected manner. Legatissimo, exceedingly smooth and connected.

Leggiero or Con Leggierezza (*It.*) — With lightness and facility of execution.

Lento (*It.*) — In slow time. Lentando, with increased slowness.

Loco (*Lat.*) — Implies that a passage is to be played just as it is written in regard to pitch; it generally occurs after 8va alta or 8va bassa.

Lusingando (*It.*) — Soothingly, persuasively.

Lustig (*Ger.*) — Gay, sportive.

Madrigal; Magnificat; Major; Matins; Mazurka; Measure; Melody; Melodrama; Metronome; Minuet; Mode; Modulation; Motif or Leitmotif; Music.—(See special articles).

Ma (*It.*) — But: as allegro *MA* non troppo, quick but not too much so.

Maestoso (*It.*) — With majestic and dignified expression.

Main (*Fr.*) — Hand: as main droite, main gauche, or M.D., M.G., the right or left hand in piano music.

Mano (*It.*) — Hand; mano dritta, the right hand; mano sinistra, the left hand.

Marcato (*It.*) — In a marked and emphatic manner. Marcatissimo, very strongly marked.

Marziale (*It.*) — In a martial style.

Meno, or Men. (*It.*) — Less; as men. presto, less quick; men. forte, less loud; men. piano, somewhat softer; meno vivo, with less spirit.

Messa di voce (*It.*) — A swelling and diminishing of the voice on a long holding note.

Mesto (*It.*) — Mournfully, sadly, pathetically.

Mezza voce (*It.*) — With moderation as to tone; rather soft than loud.

Mezzo (*It.*) — In a middling degree or manner; as mezzo forte, rather loud; mezzo piano, rather soft.

Mezzo Soprano (*It.*) — A female voice of a lower pitch than the soprano or treble. A C clef for this voice used to be placed on the second line of the stave.

Molto (*It.*) — Very, extremely; as, molto allegro, very quick; molto adagio, extremely slow.

Mordente (*It.*) — A beat or transient shake.

Morendo (*It.*) — Gradually subsiding in regard to tone and time; dying away.

Mosso (*It.*) — Movement; as piu mosso, with more movement, quicker; meno mosso, slower.

Moto, or con moto (*It.*) — With motion, agitation, energy and animation.

Nachdruck (*Ger.*) — Emphasis, accent.

Nocturne.— (See special article).

Non (*It.*) — An adverb of negation, generally associated with troppo; as non troppo presto, not too fast.

Notation.— The art of representing musical sounds and their various modifications by notes, signs, terms, etc.

Offertory; Opera; Opera Buffe; Oratorio; Orchestra; Organ; Overture.— (See special articles).

Obligato or Obligati (*It.*) — A part or parts of a composition indispensable to its just performance, and which cannot be properly omitted.

Octave; Ottava.— An interval of eight notes.

Pastorale; Pianissimo; Piano or Piano-forte; Polonaise; Prelude.— (See special articles).

Parlando; Parlante (*It.*) — In a speaking manner; accented, as if with words in a declamatory style.

Pesante (*It.*) — With weight and importance, impressively.

Piacere (*It.*) — Will, pleasure; as a piacere, at the performer's pleasure in regard to time.

Pietoso (*It.*) — With pity, compassionately.

Piú (*It.*) — More, an adverb of augmentation; as piú presto, quicker.

Pizzicato or Pizz. (*It.*) — In violin or violoncello music, the twitching of notes with the finger, instead of playing with the bow.

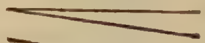
Poco (*It.*) — A little, rather, somewhat. Poco a poco, by degrees, gradually. Pochetto, Pochettino, a little, as ritard. un pochettino, play somewhat slower.

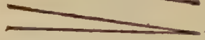
Poggiato (*It.*) — Dwelt upon, impressive.

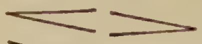
Poi (*It.*) — Then; as piano poi forte, soft, then loud.

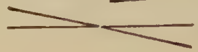
Portamento (*It.*) — The manner of sustaining and conducting the voice. A gliding from one note to another.
Presto (*It.*) — Very quick. **Prestezza, con**, with rapidity, quickness. **Prestissimo**, the most rapid degree of movement.
Primo (*It.*) — First; as tempo primo, in the first or original time.
Quasi (*It.*) — In the manner or style of; as, quasi allegretto, like an allegretto.
Quieto (*It.*) — With calmness or repose; quietly.
R. or **R.H.** — Indicates the right hand in piano-forte music.
Rallentando (*It.*) — A gradual diminution in the speed of the movement, and a corresponding decrease in the quantity of tone.
Recitatif (*Fr.*) — (See special article).
Resolution.— The concord which necessarily follows a preceding discord.
Retardando, Ritardando, Ritardato, Ritenente, Ritenuto (*It.*) — A gradual retarding and decrease in the speed of the movement.
Rhythm.— The theory of musical cadence, as applied to melody, more broadly defined in the first part of this article, to which refer.
Ricercari (*It. plu.*) — Difficult exercises, usually fugal, for the voice or for some instrument.
Ricordanza (*It.*) — With recollection, remembrance.
Rinforzando, Rinforzato, rinf. or rf. (*It.*) — With additional tone and emphasis.
Rondeau or **Rondo; Round.**— (See special articles).
Rubato or **Robato** (*It.*) — Robbed, borrowed. Tempo rubato is applied to a style of performance in which the interpreter, to express some emotional mood, holds some notes longer than their legitimate time, curtailing others of their proportionate durations in order that, on the whole, the aggregate value of the bar may not be disturbed.
Sanctus; Saraband; Serenade; Solfaing; Solfeggio; Sonata; Soprano; Stabat Mater; Symphony; Syncopation.— (See special articles).
Scherzando, Scherzante, Scherzoso, or **Scherz** (*It.*) — In a light, playful and sportive manner. **Scherzandissimo**, in an exceedingly playful style.
Sciolto (*It.*) — With freedom and boldness.
Sdrucciolato (*It.*) — Sliding or gliding the finger along the keys, or strings of an instrument.
Segno or **𝄋** (*It.*) — A sign; as al segno, return to the sign; dal segno, repeat from the sign.
Segue, Seguito (*It.*) — Now follows, or as follows; segue il coro, the chorus follows; segue la finale, the finale now follows. It is also used in the sense of in similar or like manner, to show that a subsequent passage is to be played like that which precedes it.
Sempre (*It.*) — Always; sempre staccato, always staccato or detached; sempre forte, always loud; sempre piú forte, continually increasing in force.
Senza (*It.*) — Without; as senza pedale, without pedals.
Senestra (*It.* from Lat. *sinistra*). — The left hand.
Sforzando, Sforzato or **Sf.** (*It.*) — Implies that a particular note is to be played with emphasis and force.
Sino or **Sin'** (*It.*) — As far as.
Smorzando (*It.*) — A gradual diminution as to tone.
Solmization.— The same as solfaing.
Sospirando (*It.*) — Despondingly, with apprehension.
Sostenuto or **Sost.** (*It.*) — Sustained, continuous in regard to tone.
Sotto (*It.*) — Below, under; as sotto voce, in an under tone.
Staccato (*It.*) — Implies that the notes so marked are to be played distinct, short and detached from one another. **Staccatissimo**, very detached.
Strepito, Strepitoso, Stentato (*It.*) — In a noisy, boisterous manner, for some particular effect.
Stretto (*It.*) — The knot. That part of a fugue in which the subject and answer succeed one another at a very short interval of time. In modern music it is sometime used to imply an acceleration of the time near the close of the piece.
Stringendo (*It.*) — Accelerating the degree of movement.
Tarantella; Temperament; Tempo; Theme; Tone; Treble; Trio; Triplet. (See special articles).
Tanto (*It.*) — Not so much; not too much.
Teneramente, Tenero, or **Con Tenerezza** (*It.*) — Tenderly.
Tenuto, Tenure, or **Ten.** (*It.*) — Implies that a note or notes must be held on, sustained or kept down the full time.
Through Bass or **Figured Bass.**— A bass part with figures placed over the notes which indicate the harmony to be played to each note, and serve as a guide to the accompanist.
Toccata (*It.*) — A composition of indefinite form and rapid movement somewhat in the style of the fantasia (q.v.).
Transposition.— Changing from one key to another for performance or transcription.
Traurig (*Ger.*) — Sad.
Tremolo (*It.*) — The reiteration of a note or chord with great rapidity so as to produce a tremulous kind of motion.
Trill or **Tr.**— A shake.
Tutti (*It. plu.*) — All. A term used to point out those passages where all the voices, or instruments, or both, are to be introduced.
Va (*It.*) — Go on; as **va crescendo**, continue to increase in loudness.
Variamento (*It.*) — In a varied and free style of execution.
Veloce or **Con Velocita** (*It.*) — In rapid time. **Velocissimo**, with extreme rapidity.
Vibrato, Vibrante, Vibrate (*It.*) — With a strong vibrating quality of tone.
Vistamente (*It.*), **Vite, Vitement** (*Fr.*) — With quickness.
Vivace, Vivamente, or **Con Vivacita** (*It.*) — With briskness and animation.
Vivo, Con Vivezza (*It.*) — Lively, vivaciously.
Vocalize.— To practise singing on the vowels.
Volante (*It.*) — In a light and rapid manner.
Volonté (*Fr.*) — Will, pleasure, as a volonté, at will.
Volta (*It.*) — Time of playing a movement; as prima volta, the first time of playing.
Volti subito or **V. S.** (*It.*) — Turn over the page quickly.
Voluntary.— An organ piece, generally consisting of two or three movements calculated to display the capabilities of the instrument and the skill of the player, and used before or after service, or during the offertory.
Zoppo (*It.*) — In a halting or limping manner. A style of melody in which a long note is always placed between two short notes.

Characters indicating the various degrees of loud and soft:

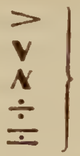

Crescendo or gradual increase of tone.

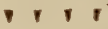

Decrescendo or gradual decrease.

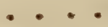

Indicates first a crescendo, then a decrescendo.

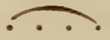

Indicates first a decrescendo, and then a crescendo.

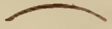
Marks of accent and expression:

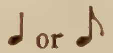

Indicate a stress or marked accent on any single note or chord. The abbreviations rf. sf. sfz. fp., or even f over a single note are also used for the same purpose.


Dashes indicate notes struck staccato or very short, that is, not held their full value.


Dots, notes struck short, but not in so marked a way as the preceding.


Curves and dots. Notes still less staccato.

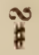

Slur, or legato mark.

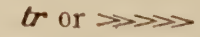

Graces.— Indicates the appoggiatura, whether superior or inferior.

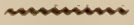
Turn.

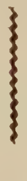
Inverted turn.

Turn with the note above made flat.

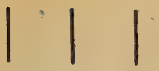

Turn with the note below made sharp.


shake.

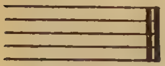

The vibration or close shake.


Indicates that the chord before which it is placed must be sprinkled or arpeggioed.

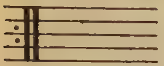
Characters used to separate a movement into its component parts or strains, marks of repetition, etc.:



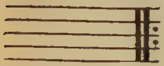
Bar lines, dividing a movement into small equal portions of duration.



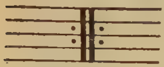
Double bar, indicating the limit of a measure.



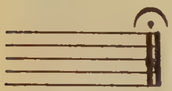
Double bar, with a repetition of the preceding strain.



Double bar, with a repetition of the following strain.



Double bar, with a repetition of the strain on each side.



The close, or character indicating the end of a piece of music.

Consult: Baker, T., ‹Dictionary of Musical Terms› (New York 1902); Bowman-Weitzman, ‹Manual of Musical Theory› (New York 1876); Hughes, R., ‹The Musical Guide› (New York 1903) and ‹Music Lovers' Cyclopedia› (Garden City 1912).

Charles Leonard-Stuart,
Editorial Staff, Encyclopedia Americana; former editor of ‹The Shophar›; associate-editor, ‹Dictionary of Music›; ‹Library of Musical Classics,› etc.

MUSICAL FESTIVALS, series of performances with large choral and orchestral auxiliaries usually held in large cities yearly or bi-yearly. While musical festivals were of periodical occurrence among the ancient Greeks at Delphi during the Olympic celebrations (see Greek Music), their first mention in modern history is at Bologna, Italy, in 1515, when at an interview between Francis I, king of France, and Pope Leo X, the musicians of both courts united for a performance. Musical festivals were also known in Rome, France, Bohemia, Austria, etc., but in the modern acceptance of the term the great musical festivals date from the Handel Commemoration in London (1784–87). Festival performances of Handel's oratorios were subsequently given in Berlin and other Continental cities. In the United States the better-known entertainments of this kind are the Cincinnati, Ohio, the Worcester, Mass., and the Bethlehem, Pa., musical festivals. See Oratorio.

MUSICAL INSTRUMENTS, mechanical devices from which musical sounds are produced by the vibration of strings, the movement of air-columns in tubes and the vibration of solid and hollow bodies of resonant materials. Of very ancient origin, their earliest forms were probably derived from suggestions offered by inanimate nature. The earliest authentic record of a musical instrument giving a complete diatonic scale is that of a flute of Egyptian origin; but it is more than probable that the first instruments were those of percussion, such as drums, cymbals and gongs, which were suggested by the clapping of the hands, the stamping of the feet and the resonance of hollow trees under the impact of blows. These were followed by the wind instruments, such as whistles and flutes, suggested by the sighing of the wind through standing reeds and bamboo grooves. They were first used, probably, for hunting purposes; subsequently, to express human emotions and for purposes of amusement.

When the human ear learned to recognize variations of pitch and to distinguish tune from time, the twanging of bowstrings probably suggested the stringed instruments, such as the harp, lute and lyre.

These three stages of the development of musical instruments are very clearly established by existing examples of gongs of stone and flutes of bone, found among the flint implements of the ancient cave-dwellers and in the tracings of the later forms — stringed instruments, in the sculpture of ancient Babylonia, Egypt and Greece. It is impossible, however, to determine the exact origin of any one of the higher classes, such as those of the third stage; since even that of the lyre is ascribed by Egyptian and Greek mythology to the god Toth (Hermes), thus throwing the entire question of origin beyond the pale of written history.

Prehistorical forms of musical instruments have their counterparts among the many savage tribes and nations of civilized mankind who inhabit the various parts of the world at the present time. African Kaffirs, the Caribs, Peruvians and Indian races of the American continents and the wild inhabitants of Australia, New Zealand and the other Polynesia Islands, use various forms of gongs, flutes and harps. The war trumpets of the Maoris are of remarkable power, the sounds of which are capable of being heard at a distance of several miles. Among the more highly civilized nations, the Chinese possessed a system of music and its instruments centuries before the birth of the Greek and Roman empires. The invention of these is ascribed to a traditional emperor, Kai-tien-chai, who ruled about 2500 B.C. The eight instruments he made are supposed to reproduce the sounds of eight substances — tanned skin, stone, metal, clay, strings of silk, wood, bamboo and calabash or gourd. They consisted of drums, musical stones, bells, clay whistles or flutes, called «hiuen,» the «kin,» a form of lyre with seven strings, the «che,» of 25 strings, and the «siao,» a pan-pipe of 16 bamboo pipes bound together. All of them are used at the present time, together with the «cheng,» an elementary reed organ equipped with a calabash, which supplies the necessary resonance. Trumpets and banjoes are also used, and a stringed instrument on a frame resembling a mallet, the sounds of which are of the most execrable character. Its value in an orchestra appears to be quite beyond the appreciation of any but a Chinese ear. They have two scales corresponding to the white and black keys of the modern piano, and, although by employing both of these scales they could reproduce modern Occidental music, they appear to be satisfied to confine themselves to the five-note scale, and produce a slow music overlaid with a great amount of noise and clatter, through which it is impossible to distinguish the underlying truly musical notes of great rhythmic beauty.

Almost all of the Chinese instruments, slightly modified, are used by the Japanese. The «kin» and «che» are represented by the «koto,» of 6 to 13 strings. They have also the «samisen» of three strings, which are plucked by a plectrum, and the «kokiri,» an elementary violin played with a horse-hair bow. Their orchestra is usually composed of one large drum, two small drums, two little bells, a pair of modern clappers and a flute, which is the only one of the seven capable of giving more than a single tone. Bells and metal in other forms, such as chains and gongs of various sizes, are extensively used in all Oriental countries to produce metallic music. In Pegu, Siam and Burmah, arrangements consisting of 20 bells united in one instrument, which is sounded by being struck with a stick, are frequently employed. The Javanese bells, usually arranged in sets of 12, when heard at a distance sound like an orchestra of stringed instruments.

In Hindustan and all of the countries contiguous to that great peninsula, the principal instrument is the «vina,» a form of guitar. It consists of seven long metal strings strung on a hollow bamboo body, at each end of which a gourd is fixed to increase the resonance. It has a finger-board like that of the guitar, upon which the frets are stuck with wax by the performer. The strings are tuned at large intervals, and its full, delicate tone is capable of rendering rapid and brilliant passages. It reached its highest state of perfection in the 17th century, when the Hindu, Djivan Shah, became renowned as its most famous player. Some of the other important Hindu instruments are the «magoudhi,» also of the guitar type; the «serinda,» with three strings of spun silk; and the «ravanstron,» a two-stringed violin. The two last named are played with a simple bow. They also use a great many varieties of drums, gongs and bells.

Among the Singalese, the favorite instrument is a drum commonly known as the «tom-tom,» a name which literally signifies its peculiar quality of music. It is made in various sizes, and consists of a short cylinder of wood from four to six inches high and one to four feet in diameter, with sides one-half to one inch in thickness, over which a skin is mounted. Before using, they are heated to a high temperature to increase the tension of the skin, and are then played upon by the hands, the blows being delivered in rapid succession on the edge of the drum. The performers are always women, and the test of the ability of a player depends upon the amount of noise produced and the duration of a continuous play.

With the westward advance of civilization, the development of Arabian music produced the «rehab,» an instrument of two strings, which were at first plucked like those of a guitar. It was subsequently played with a bow, and is supposed to be the progenitor of the modern violin. Other Arabic instruments are the «lute»; the «canon,» a stringed instrument; the «dulcimer,» with strings tuned in sets of three — a system adopted in the modern piano; the «zamar,» the prototype of the modern oboe; the «nefye,» a form of trumpet; the kettle-drum and various kinds of flutes.

The Egyptians used harps, guitars, mandolins, several forms of lutes and the lyre, as early as the beginning of the 18th dynasty. Their percussion instruments were large and small drums with sides of baked clay, over which the skins were stretched. Like the Singalese «tom-tom,» they were heated prior to being played upon. Metallic music was produced by the «sistrum,» a set of metal bars which were struck or shaken rhythmically. Although their instruments were often employed in orchestral combinations, it is impossible to determine whether they were played in harmony or merely in unison.

While the Egyptians showed great genius in the invention and adaptation of musical instruments, those of the ancient Hebrews were borrowed almost entirely from other nations. They used the «kinnor» or harp, and the «asor,» an instrument of 10 strings, both of which were forms of lyres; the «neble,» a modification of the Arabian dulcimer, and the «timbrel,» a small tambourine or hand drum. They also used flutes and trumpets, the guitar and the sistrum. Their organs were simple sets of pan-pipes, which varied in the number of pipes set up and the number of tones given by each pipe. The most famous of these is the one mentioned in the Talmud as set up in the Temple at Jerusalem. It is stated that its sound could be heard at a distance of 10 miles. Its name, «magrepha» (fire-shovel), leads to the inference that it might have been operated by the pressure of hot air, or even steam, like some of the various forms of eolipiles.

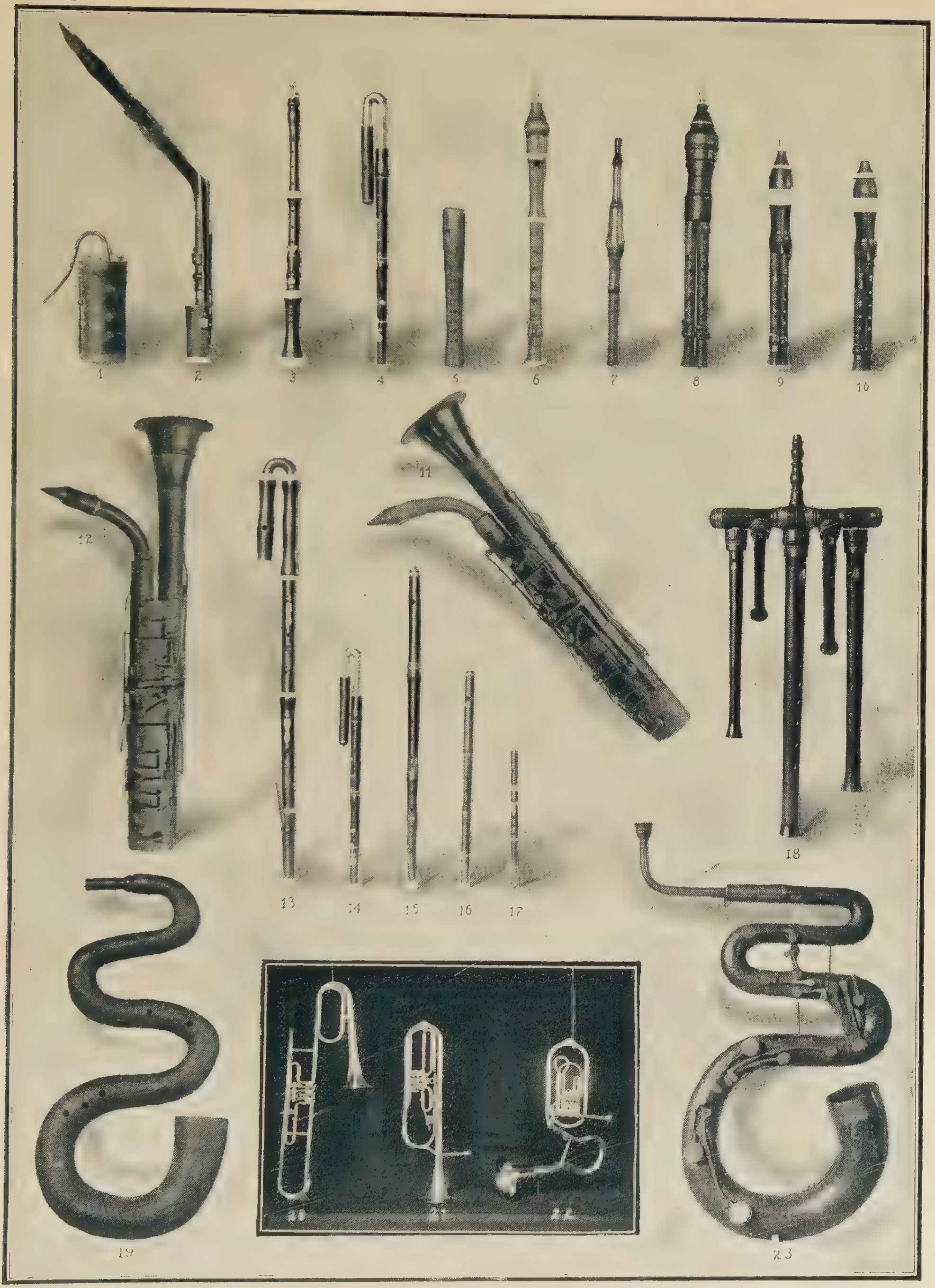
The ancient Greeks employed the music produced from stringed instruments, by striking or plucking, as an accompaniment to the recitation of their epic poems, the chants of their religious ceremonies and in connection with martial evolutions. Their most important instrument was the «kithara,» a lyre of seven strings, which were sounded by being plucked with a plectrum. They also used several kinds of single and double reed flutes, in the playing of which they acquired surpassing skill. In the rendering of refined music, trumpets were discarded at a very early date, but continued in use for military purposes and at the public games, down to a comparatively late period.

The music of the early Romans was merely an imitation of the Greek art, but their representative instrument was the «tibia,» a wind instrument of the flute type. Stringed instruments played with two bows were unknown among them, and the historical statement that «Nero fiddled while Rome burned» must certainly be relegated to the domain of myths.

For a long period of time after the fall of the Roman Empire the decadence of the art of music limited the use and retarded the development of musical instruments. During the Dark Ages the musical thread was continued by bands of strolling players, whose efforts were of the most superficial character, and music thus remained latent until the 12th century, when the poetry of the «troubadours» in Provençal literature was converted into the emotional songs of the «trovieres» and the German «minnesingers,» and required instrumental music for accompaniments. Those brought into use again were several forms of lutes, violins and bagpipes, which were played upon proficiently by the «jongleurs,» some of whom played also upon psalteries, organistrums, guitars and tambours with great skill. These instruments were made in unique forms, especially the organistrums, which were lutes operated by wheels and keys.

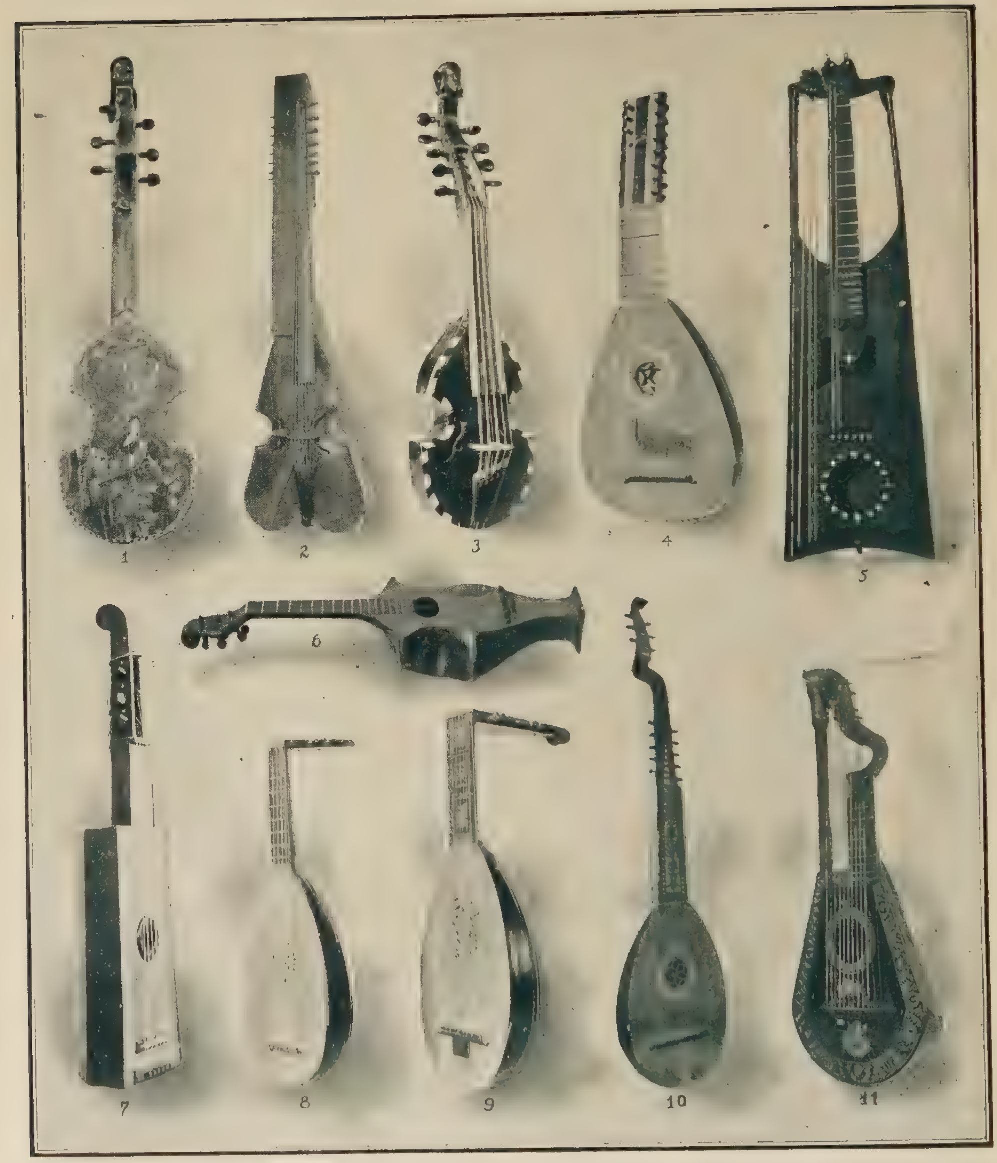
Under the impulse of the Renaissance, a large number of other instruments were developed, such as flutes, flageolets, clarinets, trom-

MUSICAL INSTRUMENTS



1 Wurst fagott
2 Basset horn (nineteenth century)
3 Oboe (France. Camus, eighteenth century)
4 Transverse flute
5 and 6 Double flutes
7 Flageolet (French, nineteenth century)
8 Double flute
9 and 10 Flutes á bec
11 Clarinet (Italy, early nineteenth century)
12 Clarinet (France)
13, 14, 15, 16 and 17 Transverse flutes with keys
18 Flute polyphonique (Italy, seventeenth century)
19 Serpent
20, 21 and 22 Trombones
23 Serpent (made in England, 1820)

MUSICAL INSTRUMENTS



1 Alto viol, with six strings and pegs (made in France, eighteenth century)
2 Baryton (Viola di Bordone, 1779)
3 Pochette D'Amour (France, eighteenth century)
4 Mandora (made in Italy, eighteenth century)
5 Lyre guitar (eighteenth century)
6 and 7 Guitars
8 and 9 Lutes
10 Theorbo (made in Italy, eighteenth century)
11 Harp Lute (1800. Light London)

bones and various forms of monochords, their development keeping pace with the evolution of music up to its higher forms; but it was not until about the end of the 16th century that any attempt was made to combine them into a definite orchestra, the development of which is coincident with that of the opera.

The first approximation to an orchestra was the group of instruments employed in connection with the production of Cavalieri's oratorio, 'La Rappresentazione dell' Anima é del Corpo,' at Rome in 1600; but the first definite orchestra was the one that accompanied the first opera ever performed in public — Peri's 'Euridice' — at Florence, in the latter part of the same year. It was composed of a harpsichord, a guitar, a viol da gamba, a theorbo or large lute and three flutes. In both cases the combination of the instruments was designed to afford the simplest possible accompaniment to the dramatic recitative; but a few years later Monteverde noted the individual peculiarities of the several instruments, and introduced a new system of orchestration by which the number of pieces was greatly increased and the instruments given a score practically free from the limitation of the vocal parts. His opera, 'Orfeo,' produced at Mantua in 1608, was accompanied by 36 pieces, 22 of which were stringed instruments, mostly viols, thus making them the foundation of the orchestra. With the evolution of the dramatic work to higher forms, better accompaniments were required, and the preponderating viols were superseded by violins, during the earlier part of the 18th century, while later on, during Handel's time, Lully introduced flutes into the French orchestra to double in unison the parts of the stringed instruments. The strengthening of the violins is shown to a marked degree by the orchestras of Scarlotti and Lyrenzi, as many as 20 violins entering into their composition. Up to this time, however, the real art of writing for the strings was unknown. The works of the elder Bach, probably the greatest master of part writing, and those of Handel, subsequently reorchestrated by Mozart, show a great lack of appreciation of tonal coloring, and it remained for Haydn to lay the true foundations of the modern science of instrumentation. He dispensed with the obsolete instruments employed by his predecessors and arranged five combinations by the skilful use of which are produced the great orchestral effects of the present time. They are (1) the complete string band, composed of two violins, violas, violoncellos and contrabasses; (2) the string band supported by wind instruments playing in unison with the string parts; (3) the string band supported by the wind instruments in the free parts; (4) the string band with wind instruments playing in the separate passages; and (5) the string band supported by and contrasted with a complete wind band.

The instruments entering into these combinations in a modern orchestra may be conveniently arranged into four general groups, according to the means employed to produce their sounds, and in the order of their respective importance, as follows: (1) stringed instruments; (2) wind instruments; (3) instruments of percussion; (4) instruments operated by keys arranged in a keyboard.

The stringed instruments may be subdivided into two classes: (1) bowed instruments, or those in which the sound is produced by drawing a horse-hair bow across the strings; and (2) those in which the sound is produced by twanging the strings with the fingers, or with a plectrum of bone or ivory. To class 1 belong the violins, violas, violoncellos and the double bass. Plate I shows typical forms of some of the 18th century makes.

The violin is the most important instrument in an orchestra and the first violinist ranks next to the conductor himself, and ought to be a performer of the greatest ability and fully capable of playing the obligato passages that occur frequently in modern scores. It is the most personal of all instruments, because of the wide range of vibrations which may be utilized, rendering it capable of expressing every human emotion from sadness to merriment and from the deepest love to the utmost frenzy of hate; its use in the orchestra is varied, continuous and extensive. In the violin quartet the next important instrument is the second violin, which, being played in a lower part of the accordance, gives the difference of sound heard between itself and the first violin. The viola or tenor takes the third place and is a fifth lower in the accordance, the open notes being C and G below, and D and A above, middle C. It is played exactly like the violin, and its part in the score is notated in the alto clef. It has a wonderfully beautiful and peculiarly plaintive and melancholy tone quality. The fourth place is filled by the violoncello or bass viol. Its strings are tuned in fifths, one octave lower in pitch than those of the viola, the accordance being C below and C, D and A in the bass clef. It has a compass of three and a half octaves, and its tone color, like that of the violin, is capable of expressing with surpassing faithfulness all the human emotions. Its harmonies are rich and full; the «pizzicato,» especially telling in effect, while the tone of the A string is the most suitable of all instrumental music for passionate expression. The contrabass or the double bass is used to double the part of the violoncello an octave deeper. While the violoncello is the bass of the stringed instruments, the contrabass is the bass of the whole orchestra. They are of two types, those with three strings tuned in A, D, below G in the first space in the bass clef, and those with four strings tuned in E, A, D and G, in ascending order, an accordance rendered necessary by the works of modern composers. Its tone is gruff and ponderous, unfitting it for use as a solo instrument, but it is used with great effect to give an ominous significance in solo passages, and in imitating such effects as the rumblings of a thunder storm, frequently employed by many of the great composers.

To class 2 belong the mandolin, guitar and banjo, instruments of a few strings, and the harp and zither, instruments of many strings. Of these the harp is the most important. Of very ancient origin, probably Assyrian, it has been used by the musicians of almost all of the ancient and modern nations. The «minnesingers» employed it in combination with the guitar to accompany the songs of the troubadours. In 1720 Handel introduced harp parts in one of the choruses of the oratorio of 'Esther.' Gluck employed it to play the part of the lyre in the hands of Orpheus. Mozart wrote a concerto for it in combination with the flute, and Wagner introduced eight of them in the closing scene of ‘Das Rheingold,’ their shimmering music giving an indescribable splendor to the entrance of the gods into Valhalla. The great musical value of the harp is its sympathetic tone quality and the power of its full-sounding «arpeggios» or sweeping chord effects. Almost all of the music written for the pianoforte can be reproduced effectively on the harp, but it is almost incapable of rendering the chromatic passages. It is the only instrument of this class that forms a part of a regular orchestra, the mandolins and zithers being used only in the orchestration of large compositions. The tones of the guitar are especially suitable as an accompaniment for the human voice and are notably used for this purpose by Rossini in Almaviva's air in the ‘Barber of Seville.’

As previously stated, wind instruments were introduced into the orchestra by Lully merely to double in unison the parts of the stringed instruments; but since then various changes and improvements have been made by eminent flutists and skilful flute-makers, especially those of the 19th century, until their importance is hardly exceeded by that of the stringed instrument.

They may be divided into two classes, according to the materials of which they are made: (1) wood-wind, and (2) brass instruments. Many of both classes are of the transposing type — instruments in which the sounds actually produced are a key either above or below that in which the composition is written. To the wood-wind band belong the flute, piccolo, flute á beck, horn or cor anglais, bassoon, double or contra-bassoon, flageolet and the clarinet. They are usually made of wood, and sometimes of ivory and silver; but their particular tone qualities do not depend so much upon the material of which they are made as upon their form and the elasticity of the sides of the tubes. The flute, which is the most facile of them all, has a full chromatic compass from middle C to G, two octaves above the treble clef C, a range of three octaves. This compass is partly obtained by altering the pressure of the blowing, all of the notes below D in the treble being produced by the normal pressure, while the harmonics D in the treble clef and A and B above it are attained successively by over-blowing. In the orchestra the flute goes with the violins, its part in the score being written at the top in G clef. It is also used to sustain the long notes of the other wood-wind instruments, and, being the closest approximation of artificial sounds to the human voice, is used effectively in the conversational passages, and enhances the characteristic charm of orchestral music. In the form of the «piccolo,» or octave flute, it is more frequently employed to double the melody in the highest octaves and to accentuate brilliant points of effect in the score. It is exactly an octave higher than the flute proper, and is very shrill in the over-blown notes, so that, unless very carefully played, tends to vulgarize the music. Other forms are the D-flat or minor ninth transposing piccolo; the flute d'amour, a minor third below the ordinary flute; the E-flat or «tierce,» and the fife. The last named, in its old cylindrical form, gave low, piercing notes, and was extensively used in military music, but it has been entirely superseded for that purpose at the present time by a small flute, still called a fife, which forms a component part of a modern fife and drum corps.

Next in importance to the flutes is the family of oboes, represented during the 16th and 17th centuries by the little schalmey, the discant schalmey, the alto, the tenor and the pommers. The modern oboe was evolved from the discant schalmey, and is a double-tongued reed instrument. Its fundamental sounds are reproduced an octave higher by over-blowing, its scale being thus increased to two partially chromatic octaves, which are made completely chromatic by the use of keys which permit the lengthening of the air column in the lower tones, and the introduction of other partial tones than the first harmonics in the higher notes. Like the flute, it has only the soprano register — B-flat below middle C to F above the treble clef, about two octaves and a fifth. The basis of the scale is D major, and its place in the orchestra is between the flute and the clarinet. A modern orchestra employs two oboes — the non-transposing treble oboe, for which the music is written in G clef, and the «cor anglais,» a transposing instrument, the mournful sounds of which are especially suitable to accentuate the depressing effect of the sad or serious dramatic passages.

The bassoon is the bass of the oboe and fulfils that function to the entire wood-wind band. It was evolved from the pommers, bombards, tenors and basses of the 16th century, and possesses advantageous tonal characteristics and adaptability. It has a compass of three octaves — from B-flat, an octave below that in the bass clef, to B-flat in the treble clef — and is usually played with the violoncello, the united tones of the two instruments being very effective. The contra-bassoon is an octave below the violoncello and is the deepest instrument of the orchestra. Its compass extends as far as B-flat, next to the lowest note of the pianoforte. It is but rarely used, although its grand sounds, like those of a great organ pipe, may be used effectively, as in the grave-digging scene of Beethoven's ‘Fidelo,’ and in Handel's anthems, written for the coronation of George II in 1727. Although a wood-wind instrument, it is now also made in brass with a reed mouthpiece. The sarrusophones, invented by Sarrus of France, comprise a complete family of this type. They are larger than the corresponding wooden oboes, and are therefore louder in tone and are extensively used in military bands. Other forms of double-reed instruments are the «cormorne,» made of wood and cylindrical in shape, with the lower end turned up like a shepherd's crook. The name is derived from the German *Krummhorn*, and the French call it the *tournebout*. It has a bleating tone. The familiar Highland bagpipe, and various forms of oboe instruments equipped with reservoir of air and furnished with drones enclosing single reeds, such as the «cornemuses,» and the «musettes,» complete the series.

Of the single-reed instruments, the «clarinet» is the most important. It was invented by Christopher Denner of Nuremberg, in 1690, and embodies the very ancient principle, that of the «squeaker» reed, which is commonly made by children even at the present time.

Of the several forms of clarinets those in A- and B-flat are used by the modern orchestra, while the B-flat and E-flat instruments are used in military bands, in which their functions correspond to that of the violins in the orchestra. The C clarinet with its shrill tone is seldom used. Their color varies according to the register. The ordinary notes are eloquent, heroic and tender; in the lower register they become spectral, and impressively sombre in the bass. Although the last instrument introduced into the orchestra, all the great composers wrote for it, and considered it favorably. With Mozart it was one of the leading instruments of the orchestra, and in his beautiful E-flat symphony, written in 1788, clarinets are employed even in the place of the oboes.

As in the case of the double-reed woodwind instruments, in which the mouthpiece is used with a metal tube and gives the sarrusophone, the adaptation of the clarinet-reed to a brass tube gives the family of «saxophones,» invented by Adolph Sax in 1846. They resemble the clarinets very closely in shape; have a full, rich, penetrating tone-color, and are extensively used by the military bands of France and Belgium, and have also been used with great advantage in the French orchestras.

Of the «brass instruments,» the most important are the horns, cornets, trumpets, trombones and tubas. Two other forms, the ophicleide and the serpents, though frequently employed in the older orchestral scores, are now obsolete, having been entirely superseded by the tuba.

There are two important differences between the wood-wind and the brass instruments. In the former the tones are produced by vibrating air-columns, or by vibrating single or double reeds, and alterations of pitch are accomplished by shortening the air-columns, while in the latter the vibrations utilized are those of the player's lips, which are pressed against a round, cup-like mouthpiece, and the air-column is lengthened to alter the pitch. The brass instruments are capable of giving a much larger number of partial tones naturally than the flutes, oboes and clarinets, which use only a few notes of the harmonic series, and derive such partial tones from the fundamental tones, or from the overtones. Horns and cornets furnish romantic tone-coloring, and are effectively used in connection with forest and hunting scenes, while the trumpets are employed to express brilliant martial passages depicting heroic deeds. Trombones and tubas are grand, sonorous tubes which afford a solemn and menacing tone-color to the splendor of a full orchestra, and are also advantageously used to depict coarse and brutal scenes. All of them are valuable components of modern military bands. Plate II illustrates various types of wind instruments, developed from their original forms into perfect instruments during the latter part of the 18th and the earlier part of the 19th centuries.

The instruments of percussion are those which are incapable of giving many tones, or playing definite melodies, like the stringed and wind instruments already described. They are of two classes — those that give an actual tone, such as the kettledrums, glockenspiel and xylophone; and those without any definite pitch, such as the bass and small drums, tambourines, cymbals, castanets and triangles. Of these, the kettledrums are the most important, and, together with the cymbals, are extensively used to emphasize military effects; while the others serve to express those that are purely rhythmical. For detailed descriptions of all of the instruments mentioned, see special articles under their respective titles; also ORCHESTRA, INSTRUMENTS OF THE. For descriptions of keyed instruments, see articles on the ORGAN and the PIANOFORTE.

Bibliography.— For further detailed information consult Elson, 'Orchestral Instruments and their Use' (Boston 1903); Hawkins, 'General History of the Science and Practice of Music' (London 1875); Hofmann, 'Katechismus der Musikinstrumente' (Leipzig 1890); Vidal, 'Les Instruments a Archet' (Paris 1878), and Schletterer, 'Die Ahnen moderne: Musikinstrumente' (Leipzig 1882).

MUSICAL INSTRUMENTS, Mechanical. The record of inventions and devices in this field shows a great variety of shapes, sounds and methods of operation. One of the most famous in this class of music-producers was Barnum's steam calliope, used for many years in circus processions. Organs of all sizes and shapes, set in motion by the occasional turning of a crank or pressing a button, are widely used for purposes of public entertainment. Swiss music boxes with cylinders and American music boxes with discs are embraced in the same class. There are also mechanical banjos, violins, zithers, mandolins and trombones.

Progress of the Piano-Player.— Since the advent of the first piano-player, a few years ago, rapid strides have been made in the creation and production, by purely mechanical methods, of classical and popular music. The perforated paper roll, passing over a perforated wooden cylinder, so that a current of air may pass at stated times, still forms a leading feature of the automatic idea in many pianos. See PIANO.

The earliest efforts of those who undertook to create and introduce mechanical harmony effects yielded crude, unsatisfactory and unpromising results. Progress was blocked at every turn by practical difficulties not contemplated in theoretical calculations and experiments.

First Products.—Among the first products of the mechanical piano-playing movement was an odd-appearing, seemingly over-elaborate accumulation of rubber-tubes, strikers, bellows and pedals, nearly all of these contrivances and accessories being fixed to a wooden frame and inserted in the back part of the piano, between the frame-posts. It was found impracticable to include all necessary material without increasing the size of the piano proper. This was accomplished by adding several inches to the piano's depth.

Portable Players.— Notable among the next succeeding stages of piano-player development was the invention and perfecting of a movable and easily-portable player, having cylinder, perforated rolls and pedal action. About half the regular piano width and only a trifle higher than the keyboard, this «supplement» can be moved at will to the centre of the piano, in front. Operation of the pedals results in the bringing of any one or more of a series of hammers or strikers in direct contact with the key surfaces, speed and force being regulated by several thumb-pieces projecting from the player top or side. Players of this description, with many variations, are still in use but have been partially superseded by more elaborate contrivances.

Interior Players.—After many costly experiments, covering several years, an interior player, which has been very successful thus far and promises to evolutionize the whole industry of piano-making, was perfected. It was found possible to minimize the parts in such a way that practically the entire player apparatus, excepting, of course, the pedals, could be placed above the keyboard in front of the action and behind the fallboard, the latter hiding it completely from view. Thousands of these pianos containing mechanical players have been made and sold. Makers of pianos of all grades have accepted this interior player, with modifications, as permanent, and it is becoming a standard feature in regular piano styles.

Electricity Introduced.— In the interval between the perfecting of «movable» and «interior» piano-players, an enterprising practical New York electrician and piano-action maker secured certain important player rights and privileges and set to work on the problem of electrical operation. Experiments, extending over several years, were finally successful. Electrical attachments were devised and introduced in such a manner as to make it possible for any person or firm, in any part of the world, having a simple electrical connection, to start and stop the player at will. The advance in usefulness of the mechanical piano-player thereby reached a stage where it only needed the occasional insertion of a perforated roll to produce, without any further physical effort whatever, perfect musical effects, including correct tempo and proper expression.

Continuous Rolls.— Since that time, continuous rolls have been devised to admit of several tunes being played successively without any interference on the part of the person who applies the electrical connection and turns on the current. The electrical-attachment device just referred to, with numerous variations, is now largely in use throughout the United States, Canada and other countries for the entertainment of guests, travelers and others in restaurants, hotels, saloons, railroad stations and similar public resorts. Some are operated by use of an electric button conveniently placed at tables, hotel desks and in private apartments. Others start by the insertion of a coin in a metal slot at the side of the instrument.

The manufacture of pianos in the United States gives employment to 24,000 persons, and piano materials 10,500 more. Organs and organ materials employ 3,300; other musical instruments and materials 2,000. These figures do not include phonographic machines for reproducing music. The musical instrument industry centres mainly in Indiana, Illinois, Massachusetts, New Jersey, New York and Michigan.

MUSICAL SAND, beaches which emit musical tone or other sound when the sands are pressed under foot or struck together in a bag. They occur throughout the world, notably in the peninsula of Sinai, on the great musical mountain of Jebel Nagous; near Colberg in Pomerania; on the East Prussian coast; in the United States, where there are such sonorous beaches on the Atlantic, on the Wisconsin River (near Kilbourn City, Wis.), on the Mississippi (opposite Carondelet) and on the Pacific Coast; in Hawaii, where there are «Barking Sands» on the southwest coast of Kauai; in Africa (Liberia and West Griqualand); in Botany Bay, New South Wales; and in Brown's River Bay, Tasmania. The sound is a mere squeak unless the sand is very dry; then it is musical. Hence the common explanation that the sound is due to the «rubbing together of millions of clean sand-grains very uniform in size» is less likely than the hypothesis that it is caused by the oscillation of the particles which are prevented by elastic air-cushions from actual contact.

MUSK, or MUSCOVY, DUCK. See Duck.

MUSK-DEER, a small deer-like animal (*Moschus moschiferus*) of the sub-family *Moschinæ* differing from typical deer in the absence of antlers in either sex, in having only one lachrymal orifice, in the presence of a gall-bladder, and, in the male, of the musk-bearing glands to which the animal owes its name. Other peculiarities are the smooth brain, long tusks (canines) of the upper jaw of the male and the character of the feet, where the «false hoofs» come to the ground. These and other characters led Flower to declare it «an undeveloped deer» — a representative of an ancient type.

The musk-deer is of small size, about 20 inches tall, grayish, marked with obscure stripes on the fore quarters and neck, thick-legged and ungraceful in form, but agile in movement. The species is confined to the highlands of Tibet and northward, where they frequent the pine woods, going to the heights above them in summer. They dwell alone or in family parties, are timid and secretive, feeding rarely except at night, and then subsisting partly on roots dug with their great teeth.

The males alone yield the musk secretion, which is furnished by a glandular sac or pouch situated on the abdomen, and averaging the size of a hen's egg. The secretion is resinous and unctuous, and becomes granular and of a dark color when dried. About 190 grains is stated to be the average quantity obtained from a single animal. When the musk-sac is first opened the odor is said by Tavernier to be so powerful that it causes the mucous membrane of the nose to bleed. The bag or «pod» is cut out by the hunters and its orifices are tied, nevertheless the contents are often found much adulterated. The substance also reaches the market in a granular form, having been scraped off rocks where it has been deposited by the animal. The best comes by way of India and China, and is known as Tongking musk; a poorer quality comes from Siberia. Formerly musk had some value in medicine, but now is used almost wholly by perfumers; and the demand is so great that the animals are now comparatively rare, and the price of musk-pod has greatly advanced over former rates.

A somewhat similar secretion is possessed by many other mammals and reptiles, and in some cases, as of the muskrats (q.v.), is very strong, especially in the mating season. The biological significance of it, no doubt, is sexual

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1 Musk Deer

2 Musk Ox

attraction. A similar odor belongs to certain plants. Consult Flower and Lydekker, ‹Mammals› (London 1902).

MUSK-OX, a singular ruminant (*Ovibos moschatus*), now confined to the Actic regions of North America, but once circumpolar, and in Pleistocene times an inhabitant of all Europe and in America as far south as Kentucky. In general appearance it much resembles a large hairy sheep. Its body is clothed in long, brownish hair, with a warm undercoat of wool, very thick and tufted on the neck and shoulders, and elsewhere long and flowing, so that it hangs down almost to the feet. A lighter saddle-shaped patch marks the middle of the back. The tail is short and invisible. The legs are short and strong, and the hoofs of unequal size and shape, the outer being much broader than the inner one. The horns are broad at the base, covering the forehead and crown, much as do those of the Cape buffalo, then curve downward between the eye and the ear and then upward and backward. The average size of the male is that of a small domestic ox. This animal seems intermediate in structure between oxen and sheep, having part of its characteristics bovine and the other part caprine. A thorough exposition of its anatomy by Dr. Lönnberg may be found in the ‹Proceedings› of the Zoological Society of London for 1900. The musky odor which belongs to them is not emitted by any special gland, but seems a general emanation, and is not very strong.

In habits these animals are gregarious, each herd numbering from 20 to 30 members. They migrate in winter from the most northern and exposed places to those farther south, or where food is more accessible, and are constantly hunted by the Esquimos as an important source of food. To this is added much destruction by fur-traders, whalers and explorers, and their numbers are much diminished. Their present winter range is rarely south of the Barren Grounds (q.v.), between Hudson Bay and Great Slave Lake. Their food consists of moss, lichens, herbage and twigs of the dwarf willows and birches which grow in parts of their country. They are extremely wary, and their hunting requires great skill and endurance. Their flesh is good, their hides very useful and from their wool might be woven an admirable cloth could it be obtained in sufficient quantity. Consult books by Arctic explorers and Allen, J. A., «Ostogenetic and Other Variations in Muskoxen (*American Museum of Natural History, Memoir*, Vol. I, N. S., New York 1913); Grinnell, Wister and Whitney, ‹Bison, Musk-Ox and Sheep› (New York 1904).

MUSK PLANT, a popular name for several unrelated plants. The one most cultivated in the United States is *Mimulus moschatus*, of the family *Scrophulariaceæ*, a native of the Western States. It is very popular in cool greenhouses and window gardens and, being hardy, in damp, shady places out of doors. In Europe the name is most applied to *Eurodium moschatum* of the family order *Geraniaceæ*, a native of the Mediterranean region, growing in gardens from annually sown seeds. The name is applied in the West Indies to *Guarea grandifolia*, which is also known as musk wood, and to *Trichilia moschata*, also called musk tree. This last popular name is also applied to a Tasmanian tree (*Olearia argophylla*). An East Indian plant (*Euryangium sumbul*) is probably best known in the markets as musk root. Its starchy roots are used as a substitute for musk in perfumery.

MUSK-SHREW. See MUSKRAT, INDIAN.

MUSK-TURTLE, or STINKPOT. See MUD-TURTLE.

MUSK-WOOD, a tree (*Guarea grandifolia*) of the family *Meliaceæ*, so called in the West Indies because the bark smells so strongly of musk that it may be used as a perfume. Although the tree attains timber size the wood contains a bitter resinous substance which unfits it for many purposes. The bark of several trees of this genus is used as an emetic and purgative.

MUSKEGON, mŭs'kē'gŏn, Mich., city, county-seat of Muskegon County, at the mouth of the Muskegon River, on Muskegon Lake, and on the Grand Rapids and Indiana, the Grand Trunk, the Pere Marquette, and the Grand Rapids, Grand Haven and Muskegon Electric railroads, about 95 miles northwest of Lansing and 38 miles northwest of Grand Rapids. Lake Muskegon, upon which the city is situated, is connected with Lake Michigan by a channel 300 feet wide and of sufficient depth for large vessels. This gives the city an excellent harbor for lake steamers, which connect it directly with all the important lake ports. The harbor is clear of ice all the year. Muskegon was first settled in 1834, although a temporary trading post was established here in 1812. It was incorporated as a village in 1861 and chartered as a city in 1869. The chief manufactures are furniture, curtain rollers, refrigerators, flour, beer, knit-goods, paper, pianos, iron products, automobile engines (Continental) and auto parts, many large foundries in malleable steel and gray iron products, electric cranes, leather and cutlery. It has a large trade in lumber, the manufactures of the city, fruit, celery, vegetables and farm products. The city has been greatly favored by the numerous donations of one of its own citizens. He has presented a public library, a gymnasium, an art gallery, a manual training school, an endowed hospital and a square upon which has been erected a soldiers' monument, and several bronze statues. The government is vested in a mayor, who holds office one year, and a council. The waterworks are owned and operated by the city. Pop. (1920) 36,570.

MUSKET, a small hand-gun with which infantry soldiers were formerly armed. When first introduced, early in the 16th century, it was discharged by means of a lighted match, and was so heavy that it had to be laid across a staff to be fired. To make use of it the soldier required to carry a slow-burning match with him which was apt to be extinguished in wet weather. The wheel-lock followed, the chief feature of which was a wheel made to revolve by means of a spring, and to cause sparks by friction against a flint. The next improvement was the flint-lock proper (about 1625), in which sparks were produced by one impact of a piece of flint on the steel above the priming powder. Musketeers were soon introduced into all armies, and in the beginning of the 17th century infantry consisted of pikemen and musketeers, and all changes in regard to the relative proportion of the two arms were always in favor of the latter. The flint-lock musket was introduced into the British army toward the end of the 17th century, and was the British musket of the days of the Peninsular war and Waterloo, known familiarly as «Brown Bess.» It was superseded by the percussion musket in 1842, this musket being in turn superseded by the rifle. See ARMS AND ARMOR; FIRE ARMS; RIFLE.

MUSKETRY, the science and art of shooting small arms (q.v.), particularly the musket or rifle (q.v.).

MUSKHOGEAN (mŭsk-hō-gē'ạn) **STOCK.** See CREEKS.

MUSKELLUNGE, MASKINONGE, etc., the great pike (*Lucius nobilior*) of the lakes of the interior of North America. See PIKE.

MUSKINGUM, mŭs-king'gŭm, a river of eastern Ohio with a course of about 120 miles wholly within the State. It is formed by the junction of the Tuscarawas and the Walhonding at Coshocton in the county of the same name, and it flows in a general southeast direction through a fertile valley to Marietta, where it joins the Ohio. The chief towns on its banks are Zanesville, McConnellsville and Marietta. It is navigable for 90 miles to Dresden. The Ohio and Erie Canal follows its course as far as Zanesville.

MUSKINGUM COLLEGE, in New Concord, Ohio, founded, under the auspices of the United Presbyterian Church, in 1837. In 1917 there were connected with the institution 30 professors and instructors, and about 760 pupils. There were about 7,500 volumes in the library. The courses lead to the degrees of A.B. and B.S.

MUSKMELON. See MELONS.

MUSKOGEE, mŭs-kō'gē, or **MUSCOGEE,** Okla., city and county-seat of Muskogee County, on the Missouri, Kansas and Texas, the Missouri, Oklahoma and Gulf, the Midland Valley and the Saint Louis and San Francisco railways. It is situated 45 miles from the eastern border of Oklahoma and about 130 miles from Oklahoma city, in a fertile agricultural region well adapted to the cultivation of wheat and other cereals and to cattle-raising. There are also abundant supplies of oil and natural gas. Industrial activity is manifested in the oil refineries; in the manufacture of oil-well supplies, of hardware, mattresses, cotton goods and agricultural implements; in the corrugated iron and steel works and the railway shops. Noteworthy are the educational establishments: the high school, Saint Joseph's College, Bacon University, etc. Other features are the new post-office building, waterworks, the property of the city and valued at $1,000,000; public parks (100 acres) and fair grounds; Carnegie library and the Town and County and Traveling Men's clubs. Muskogee is the headquarters of the government Indian agent. The commission form of government was adopted for the city in 1910. Pop. 30,277.

MUSKOGI INDIANS. See CREEKS.

MUSKOKA, mŭs-kō'kạ, Can., a county of Ontario, bordering on Georgian Bay, the name also being borne by a beautiful lake and river, and comprehensively applied to the extensive region, 4,000 square miles in extent, lying between Georgian Bay on the west, Lake Nipissing on the north, Ottawa River on the east and Lake Simcoe on the south. The capital of the county is Bracebridge, on the Grand Trunk Railroad. The region with between 800 and 1,000 lakes and smaller bodies of water, chief of which are Muskoka, Rosseau and Joseph lakes, all abounding in fish and studded with beautiful islands; several rivers and picturesque waterfalls, notably High Falls and South Falls on the Muskoka River and Bridal Veil Falls on the Shadow River, and extensive forests filled with game, is a paradise for sportsmen. It is one of the most popular summer resorts in Canada, and is visited annually by 30,000 people. During the summer steamboats ply on the principal lakes connecting with the Grand Trunk, Canadian Northern and Canadian Pacific railroads.

MUSKRAT, or **MUSQUASH,** an aquatic rodent (*Fiber zibethicus*) numerous throughout North America, and yielding a valuable fur. It is a member of the rat family (*Muridæ,* q.v.), and is, in effect, a gigantic vole or meadow-mouse, with a tail flattened sideways into a powerful swimming instrument, and fringed with stiff hairs; the hind feet are set obliquely to the leg; the ears are very small and buried in fur, the muzzle is blunt and furry; the palms and soles are naked and fringed with hairs. The average total length is about 21 inches, of which the tail is more than a third, measuring as long as the body without the head. The color varies above from almost black to pale brown; sides of head and body chestnut-brown; under-fur bluish gray; feet dark brown; tail black. Those of the Rocky Mountain region are smaller and paler than Eastern ones. The musky odor of these animals is due to a thick fluid secreted in two small glands near the generative organs, which imparts a taint to the flesh that makes it unpalatable to most persons.

These animals reside along small streams, and in swampy places generally, being most abundant around Chesapeake Bay and in the marshy lakes of the upper Mississippi region and northward to Hudson Bay. Where the banks have some elevation they form extensive burrows, which have entrances below the surface of the water, and gradually ascend till they terminate in a chamber above the level of high water. These burrows are most frequently made under the roots of trees, or in other situations of difficult access. The excavations are of great injury to artificial embankments along canals and rivers, by permitting the water to undermine and to make large breaches in them, and in some parts of the country they do serious damage to canal embankments and river-dikes. When, however, these animals inhabit low and marshy situations, they construct conical houses usually surrounded by water, not unlike those of the beaver but smaller, composed of reeds, etc., mixed with clay. These houses have subterranean passages leading to them, and are inhabited by many individuals during the winter; but in the warm weather they desert them entirely, and dwell in pairs in a bank-burrow while they rear their young. The houses contain a large, smooth-walled chamber, above the water-line; and when frozen are sufficiently solid to form a protection against all but the largest carnivora; but they are usually destroyed and swept away in the spring floods, so that a new house is erected every season.

The muskrat feeds mainly upon aquatic vegetation, especially the rootstocks and basal parts of stems, and is especially fond of the pond-lily. These it brings to the shore to eat, almost always during the night, for it is essentially nocturnal, although often seen abroad in the daytime. It is very fond of mussels, and brings great quantities of these ashore, always, when possible, at the same place, so that piles of their shells accumulate to indicate favorite feeding-spots. In summer the muskrats feed on shore-herbage somewhat, and frequently go some distance to get a meal of growing corn, garden vegetables or fallen fruit. They are accused also of occasional fish-catching, and are unwelcome in waters devoted to fish-culture. Because of the commercial value of its fur and of its destructiveness in some places, or for amusement, the muskrat is incessantly persecuted by man, as well as preyed upon by many natural enemies — minks, wolverines, foxes, wildcats, badgers, wolves, birds of prey, water-moccasins, snapping-turtles, pikes and others, which capture many young and some adults. Nevertheless they are so secretive and so prolific, and have found so many advantages in the civilized parts of the country, that they survive even in the most thickly settled districts, and are likely to maintain their numbers indefinitely. They produce from three to nine young at a birth, and often breed two or three times a year.

The fur of the muskrat is dense and soft, but inferior to that of the beaver. It was formerly little esteemed, but during the last century has come more and more into use, beginning with a demand early in the 19th century for making «beaver» hats. When this industry was ended by the introduction of silk hats the demand diminished, but revived again, until, about 1870, London was receiving about 4,000,000 skins annually besides some 500,000 consumed in America and 1,500,000 sent to Germany, principally Leipzig. The price then began to fall, but the product amounted in 1906 to about 5,170,000 pelts. The best «no. 1 black» skins averaged in London, in 1910, about 42 cents.

«Muskrat fur,» according to a recent authority, «is used more extensively in Europe than in America, the Russians and Germans being especially large consumers. It is employed in making gloves, collars, caps, capes, muffs, trimmings, linings, etc., and is made up either natural, plucked, plucked and pointed or plucked and dyed black or various shades of brown. Large quantities are used as linings for overcoats and long wraps, from 40 to 60 being necessary for each garment. Sometimes the under parts are used separately for this purpose, the natural white color being quite effective. The skins of young animals are especially suited for linings. The unplucked skins are frequently dyed to imitate mink, and sold as ‹Alaska mink,› ‹water mink› or ‹black mink.› »

Muskrats are taken by shooting, spearing in winter (through their houses, or through the ice), or, most numerously, by trapping. Ordinary steel traps are used, placed under the water inside a broken house, or in a runway or landing place, baited with an apple, or bit of parsnip, and often scented with musk or an aromatic oil, and fastened by a heavy chain so arranged, if possible, as to lead the animal to drown itself in its struggles. In certain districts, as along Chesapeake Bay, men make a regular business of trapping muskrats in winter; and even own, or rent, large spaces of marshland for that purpose. See MURIDÆ.

The books of Audubon, Godman, Hearne, Richardson, Merriam and all general writers on American mammals should be consulted; also Herrick, ‹Mammals of Minnesota› (Minneapolis 1892); Stone and Cram's ‹American Animals› (New York 1902); Hollister, N., ‹Systematic Synopsis of the Muskrats› (United States Biological Survey, North American Fauna, No. 32, Washington 1911); Lartz, ‹The Muskrat› (United States Department of Agriculture Farmers' Bulletin No. 396, Washington 1910); and the files of the *American Naturalist* and of *Forest and Stream*.

MUSKRAT, Indian, a name among the British residents in India for a shrew (*Crocidura cærulea*), about the size of the common rat, which comes into houses at night hunting for cockroaches and similar insects, and makes its presence known by occasional shrieks. This animal emits a peculiarly strong and penetrating odor of musk, which clings to everything the little beast touches, and arises from two large muskglands beneath the skin of the side of the body a short distance behind the forelimbs.

MUSKWAKI INDIANS. See SAC AND FOX INDIANS.

MUSLIM, or MOSLEM. See MOHAMMEDANISM.

MUSLIN, a fine cotton fabric. The name is said to be derived from the city of Mosul in Mesopotamia. The texture of muslin is usually plain, but sometimes adorned with figured patterns. The manufacture of muslin was introduced into Europe from India about the end of the 17th century, and it is now largely carried on both in Great Britain and in France.

MUSQUASH, a name in the Canadian Northwest for the local muskrat (q.v.).

MUSSEL-PECKER, a bird, the oyster-catcher (q.v.).

MUSSELBURGH, mŭs'l-bŭr-ō, Scotland, a town and seaport of Midlothian, six miles east of Edinburgh, on the Firth of Forth, at the mouth of the Esk, which divides it into two parts, Musselburgh proper and Fisherrow. It has noted golf-links, a bridge of Roman origin, and a curious old tollbooth built in 1590, out of materials from the celebrated chapel of Loretto, Pinkie House, a fine Jacobean mansion, in which Prince Charles Edward slept the night following the battle of Prestonpans, and Loretto School, a famous establishment, are in the burg. David Macbeth, the author of ‹Mansie Waugh,› was a native. The chief manufactures are leather, paper, twine and fishing-nets by machinery. Coal is mined in the neighborhood, and there are a number of market gardens. There is a large fishing population located in Fisherrow. The battle of Pinkie, in 1547, was fought in the vicinity. Pop. (1911) 15,938.

MUSSELS, Fresh-water. See Fresh-water Mussels.

MUSSELS, Marine. The marine mussels belong to a family (*Mytilidæ*) of bivalve mollusks which have the anterior retractor muscles very small, the postérior large and the two valves of the shell equal and covered by a thick horny layer. Numerous species occur in all seas, and, because of the comparative delicacy of their flesh, and their habit of forming immense beds, many are of commercial importance. Foremost in this respect is the edible mussel (*Mytilus edulis*) which has a smooth, dark-colored, wedge-shaped shell with the umbos or beaks exactly at the hinge end. This species is circumpolar in its distribution, and on our Atlantic coast extends southward to North Carolina. Wherever rocky reefs, piles or other suitable objects for attachment occur at low water, combined with currents for bringing food, this mollusk multiplies into extensive colonies. In Europe it is valued much more highly than in this country, where it is chiefly used for bait, although considerable quantities are canned in New York. Under certain conditions mussels seem to be poisonous. Besides the fisheries on natural beds this mussel is regularly cultivated in France by methods akin to those used in European oyster culture. The genus *Modiola,* containing the so-called horse-mussels, is distinguished by the more oblong shell inflated toward the hinge end, from which the umbos, though close, are quite distinct. The best-known one (*M. modiolus*) is a large species distinguished by the nearly unribbed surface and the coarse hairy epidermis. It has nearly the distribution of the *Mytilus,* and abounds in the north on rocky shores at low water and below to a considerable depth. *Modiola plicatula* is distinctly ribbed and has a thinner epidermis. This is an American species which ranges from Nova Scotia to Georgia and is extremely abundant at low water on the mud-flats of the New Jersey coast, where it is doubtless effective in the upbuilding of sedimentary areas. These two species are less valued for food than the *Mytilus,* but are largely utilized in certain localities as fertilizers. Consult Goode, ‘Fishery Industries of the United States,’ Sec. 1 (1884); Cooke, ‘Mollusca’ (London 1895); or any other work on mollusks.

MUSSET, mü-sā, **Louis Charles Alfred de,** French author: b. Paris, 11 Dec. 1810; d. there, 2 May 1857. His father was a man of letters who held several important ministerial posts. Alfred's home environment did much to engender a literary spirit. He was educated at the Collège Henri Quatre, where he won a prize for his essay on the ‘Origin of our Feelings.’ After this, he tried to study law and medicine, but became dissatisfied and gave himself up entirely to literature. At Paris he met the famous literary men of the day, among them Hugo, Merimée and Sainte-Beuve, who inspired him to write verse and plays. He began composing rhymes and in 1830 appeared his first volume of poems, ‘Contes d'Espagne et d'Italie,’ a parody on the latest works of the romanticists which gained him a great reputation. In 1830 his play ‘La Nuit Venitienne’ proved a failure. This discouraged de Musset so much that he refused to write plays for production until the public should demand them. There followed a new collection in 1831 entitled ‘Poesies Diverses,’ and in 1833, a third, bearing the general title ‘Un Spectacle dans un Fauteuil’ in which the chief pieces are a comedy of light and delicate grace called ‘A quoi revent les jeunes filles,’ and a poem ‘Namouna’ written after the manner of Lord Byron. The success of this volume led to his connection with the *Revue des Deux Mondes* in which he published ‘André del Sarto’ (1833) and ‘Caprices de Marianne’ (same year). In this play, which for many years enjoyed a distinguished place in the repertory of the Théâtre Français, he combines the best features of the romantic and classic schools of drama. It combines swift action with high loftiness of theme and thought; blends comedy and tragedy with Shakespearean excellence. ‘Rolla’ was the next piece to appear in the *Revue.* In the same year, 1833, de Musset conceived a violent passion for George Sand, and accompanied her to Italy. But the liaison which was only the attraction of genius for genius lasted but two years. The story is told in his volume ‘Lui et elle,’ by de Musset and ‘Elle et lui,’ by George Sand. But the affair affected de Musset profoundly. It emphasized a deep melancholy strain in his nature and a morbid sensitivity which appears in his later writings. In Italy he wrote ‘Ou ne badine pas avec l'amour.’ In 1835 there appeared ‘Lucie’; ‘La Nuit de Mai’; ‘Le Chandelier’; ‘Une Lettre à Lamartine’; ‘L'Espoir de Dieu’ and other poems. His ‘Confession d'un enfant du siècle’ (1836) is an autobiographical novel, containing the analysis of his state of mind; his moody introspection, his revolt from all the unpleasant necessities and labor of life. It contains also an interesting account of his reactions to Bonapartism, and a true story of his unfortunate liaison. Among his other works are ‘Stances a Madame Malibran,’ a volume ‘Comédies et proverbes’ reprinted from the *Revue des Deux Mondes* (1840); ‘Nouvelles,’ a play ‘Un Caprice’ performed at the Théâtre Français in 1847, which succeeded by the truth of the characters and the charm of the dialogue, rather than by its regard for stage customs. In 1848 ‘Il ne fait jurerde rien’ was successfully played at the Théâtre Français. His last plays ‘Bettine’ and ‘Carmosine’ were written between 1848 and 1851. De Musset was made librarian of the Department of the Interior in 1836, of which post he was afterward deprived, and of the Department of Public Instruction in 1855. In 1852 he was admitted to the French Academy. He has been ranked after Hugo as the third French poet of the 19th century. His wit, his fine satiric power, his many and diverse moods mark him a man of genius. A monument was erected to him on the Place du Théâtre Français in 1906. Consult biographies by Paul de Musset (1877; Eng. trans. by H. W. Preston, 1887); Barine, Arvède, in ‘Grand écrivains français.’ His correspondence with George Sand was published in 1904. See Night of May, A; One Must Not Trifle with Love.

MUSSEY, Reuben Dimond, American surgeon: b. Pelham, N. H., 23 June 1780; d. Boston, 21 June 1866. He was graduated at Dartmouth in 1803; studied medicine at the University of Pennsylvania; practised in Salem, Mass.; taught in the Dartmouth Medical School 1814–20 and 1822–38, at Bowdoin 1833–35, at Ohio Medical College 1837–50, and at Miami Medical College, which he founded, 1851–58; and spent the last eight years of his life in practice in Boston. He was a famous operator, the first to remove the shoulder blade, or to tie both carotid arteries, and successful in his operations for stone, for removing ovarian tumor, for strangulated hernia, and in subcutaneous deligation in varicocele. Mussey wrote ‹Health: Its Friends and Its Foes› (1862).

MUST, the juice of the grape, which by fermentation is converted into wine. In the wine countries this unfermented sweet must is distinguished from the sour must or unripe wine of a year old.

MUSTANG. See BRONCO.

MUSTARD, a genus of annual, biennial and perennial herbs (*Brassica*) of the family *Brassicaceæ*. The species, of which about 100 have been described, are characterized by yellow four-petaled flowers and linear or oblong pods containing one row of seeds. All are noted for their more or less biting flavor for which some are valued as esculents. Strictly speaking, cabbage, kale, cauliflower, turnip and other similar vegetables are mustards, but specifically the name is restricted to a few species of which the following are the most important: Black mustard (*B. nigra*) so called from its dark brown seeds, white mustard (*B. alba*), the seeds of which are yellowish, Indian mustard (*B. ramosa*), and charlock (*B. arvensis*). These are all cultivated for their seeds which when ground constitute the popular condiment, mustard. Sometimes flour and turmeric are added to the mustard to dilute and color it. The young plants are often eaten like spinach or as a salad. They may be easily obtained from seed sown in any garden soil.

MUSTARD GAS, a persistent though not deadly poisonous gas, first used by the Germans, at Ypres in 1917, as a very powerful weapon of war, and is officially known as *yellow cross* gas. Its chief effects are on the eyes and lungs. The eyes inflame and become very sore, the lids swell and blister, but no permanent injury to the eyes takes place, although the victim may be temporarily blinded. The effects developed in the lungs are equally painful and consist of severe inflammation and bronchitis, which if not well looked after may develop into pneumonia. «Duds» collected during the European War show that the mustard gas liquid is a chemical called *dichlorethyl sulphide,* a liquid that gives off its vapor slowly. Respirators and the blanket protection of dugouts keep out the gas, but if a dug-out gets a direct hit with a mustard gas shell, it must be left empty for some days, as the liquid cannot be removed by ventilation with either fires or fans. In battery positions the most annoying feature of the mustard gas is the length of time it persists. In the shell holes it is partly destroyed by sprinkling with chloride of lime. The British invented a method for firing a large number of drums of gas simultaneously. These drums are used chiefly against the front-line troops and are generally filled with pure phosgene. See MEDICAL SCIENCE AND THE WAR; MEDICINE, RECENT PROGRESS IN; POISON GAS.

MUSTARD OIL, a volatile, pungent, colorless, irritating oil formed in mustard seed when crushed and wet. See OIL OF MUSTARD.

MUSTELIDÆ, a family of small carnivorous mammals classified between the dogs and the bears, and traceable in geological history back to early Eocene time. The special characteristic of the family is the reduction of the molar teeth in the upper jaw to a single one. The dentition in general resembles that of the cats. The family is divisible into five subfamilies: Weasels (Mustelinæ), otters (Lutrinæ), badgers (Melinæ), skunks (Mephitinæ) and sea otters (Enhydrinæ) and thus include the ermine, mink, fisher, sable, marten, polecat and wolverine. The habitat is worldwide outside of Australasia and Madagascar, but it is in the subarctic and temperate regions of the Northern Hemisphere that the Mustelidæ are most numerous and produce the most valuable pelts. The sea otter and the skunks are exclusively American. All are small animals, the largest (the sea otter and the wolverine) being about three feet long. They are characterized by strength, nimbleness and especially bloodthirstiness, and in general have slender bodies, rather short legs, round heads, powerful jaws and strong teeth. They possess anal glands which in some genera, as the skunks, are highly developed, enabling them to discharge at will, as a means of defense, an acrid, malodorous fluid. Some of the Mustelidæ are arboreal, but most are terrestrial, living in burrows. Their food consists of small mammals, birds, birds' eggs, crustaceans, fish and insects. Their lust for killing seems to bear no relation to their food requirements; for example, a mink, gaining access to a chicken house, is likely to kill as many fowls as it can seize. The trapping and hunting of the Mustelidæ has long been an important industry in both Europe and North America. Consult Coues, E., ‹Fur-Bearing Animals› (Washington 1877); Ingersoll, E., ‹Life of Mammals› (New York 1909).

MUT, moot, *in Egyptian mythology,* a goddess of heaven and queen of earth, the wife of Ammon and the mother of Chons. Her name signifies «mother.»

MUTA NZIGE, moo'tä nzē'gä, Africa, the local name for a lake discovered by Stanley in 1876, explored by him in 1889, and renamed the Albert Edward Nyanza (q.v.).

MUTANABBI, moo-tä-näb'bē, Arabic *Abu 't Tayib,* Arabian poet: b. Kufa, 915 A.D.; d. Sept. 965. He studied in Syria and, for a period, proclaimed himself a prophet, whence the title «el Mutanabbi» (the one who would be a prophet). From 948 he resided at Aleppo under the patronage of the Prince Saif ed Daula and from 957 he lived in Egypt, Bagdad and Persia. He was killed by Bedouin robbers near the Tigris. His greatly admired ‹Diwan› consists of a collection of 289 poems and shows great talent and national spirit besides richness of language, but there are defects of exaggeration in poor taste and certain flattery that is lowering to the general dignity of the verses. Dieterice edited the work, together with the ‘Commentary’ of Wahidi, who died 1075, under the title ‘Mutanabbii carmina’ (Berlin 1861); and that of ‘Ukbari, who died 1219, was published at Calcutta, Cairo and Bulak with other ‘Commentaries.’ Hammer-Purgstall translated (poorly) the ‘Diwan’ (Vienna 1824). Consult Bohlen, ‘De Motenabbio’ (Bonn 1824); Dieterici, ‘Mutanabbi und Seifuddaula’ (Leipzig 1847).

MUTATION THEORY, a hypothesis of organic evolution which accounts for development by sudden changes or «leaps» rather than by slow and successive degrees; sometimes styled saltatorial evolution. It is illustrated by «Sports» (q.v.),— sudden aberrations from the normal, more familiar in botany than in zoology, but often occurring there. This mode of evolution has always been regarded as effective to some degree, but its general application was urged by Prof. Hugo De Vries, of Amsterdam, in his work ‘Die Mutationstheorie,’ published in 1901. Professor De Vries showed that the objections urged against the Darwinian theory on the ground of the prodigious length of time needed for the development of species could be explained away by a due regard to the phenomena of mutation. He showed that new species are produced in this way not only on a single occasion, or with single individuals, but repeated continually and in large numbers. In the field of botany to which Professor De Vries' investigations were confined, he established the fact that mutations take place in the seed, independently of the vicissitudes of growth in the field, and in accordance with certain apparent laws. The new species which results from mutation remains constant but exhibits a tendency to throw off an ever increasing series of variations. Consult De Vries, H., ‘Species and Varieties’ (Chicago 1906); Lock, R. H., ‘Recent Progress in the Study of Variation.’

MUTHER, moo'tĕr, **Richard,** German art historian: b. Ohrdruf, Germany, 25 Feb. 1860; d. 1909. He was educated in the University of Heidelberg and the conservatory of Munich and devoted his attention to the history of art in which subject he was professor at the University of Breslau since 1895. He has published ‘Anton Graff’ (1881); ‘Meisterholzschnitte aus den Jahrhunderten’ (1887); «Geschichte der Malerei des 19ten Jahrhunderts’ (1893; Eng. trans., ‘History of Modern Painting,’ 4 vols., 1907); ‘Geschichte der Malerei’ (5 vols., 1899–1902; Eng. trans. by George Kriehn, 2 vols., 1907).

MUTINY (Fr. *mutin,* refractory, stubborn; *mutiner,* to rise in arms). Two hundred years ago the word mutiny was often used in describing insurrection or sedition in civil society; but it is now applied exclusively to certain offenses by sailors and soldiers. Properly it is the act of numbers in resistance of authority; but by statutes, certain acts of individuals are declared to be mutiny. The act of Congress of 3 March 1835 defines mutiny or revolt in the following language:

> If any one or more of the crew of any American ship or vessel on the high seas, or on any other waters within the maritime and admiralty jurisdiction of the United States, shall unlawfully, wilfully, and with force or by fraud, threats, or other intimidations, usurp the command of such ship or vessel from the master or other lawful commanding officer thereof; or deprive him of his authority and command on board thereof; or resist or prevent him in the free and lawful exercise thereof; or transfer such authority and command to any other person not legally entitled thereto; every such person so offending, his aiders and abettors, shall be deemed guilty of a revolt or mutiny and felony.

The same statute provides for endeavors and conspiracies to excite mutiny. In construction of the act it has been held that mere disobedience of orders by one or two of the seamen, without any attempt to excite a general resistance or disobedience, and insolent conduct or language toward the master or violence to his person, if unaccompanied by other acts showing an intention to subvert his authority as master, are not sufficient to constitute the offense of endeavoring to excite mutiny. An indictment for this crime, it is said, must set forth a confederacy of at least two of the men to refuse to do further duty, and to resist the lawful commands of the officers. The offense of making a revolt was by the act of April, 1790, punishable by death. By the act of 1835, it is punished by fine not exceeding $2,000, and by imprisonment and confinement at hard labor for not more than 10 years, according to the nature and aggravation of the offense; while attempts to excite a mutiny are punishable by fine not exceeding $1,000, or by imprisonment not exceeding five years, or by both. Mutinous conduct in the army and navy is provided for by the acts of 10 April 1806 and of 23 April 1800. By the former, «any officer or soldier who shall begin, excite, cause or join in any mutiny or sedition, in any troop or company in the service of the United States, or in any party, post, detachment, or guard, shall suffer death, or such other punishment as by a court martial shall be inflicted.» Under the latter, «if any person in the navy shall make, or attempt to make any mutinous assembly, he shall, on conviction thereof by a court martial, suffer death.» These laws are embodied in the present articles of war and articles for the government of the navy, except that death is not now mandatory in the navy. The law of mutiny in Great Britain is in general similar to the United States statute, except that the penalty of death is not imposed.

MUTOSCOPE, a mechanical apparatus for exhibiting instantaneous pictures of moving objects taken by the kinetograph or similar instrument. Photographic prints from the series of pictures thus obtained are mounted in consecutive order around a cylinder standing out like the leaves of a book. When this cylinder is slowly revolved, the picture cards being held back by a stop, and allowed to snap past the eye one by one, as one thumbs the leaves of a book, an apparently moving picture is the result. See CINEMATOGRAPH; MOVING PICTURES.

MUTSU, mu̇t'su̇ or mu̇t's', **Munimitsu,** COUNT, Japanese statesman: b. Wakayama, 1842; d. Tokio, 24 Aug. 1897. After six years' foreign services and as governor of the province Kanagawa he was appointed (1874) secretary of the senate. He suffered a long imprisonment, from 1878, for participation in the Saigo Rebellion, but was pardoned in 1882 and was again employed in foreign affairs by the state. From 1888–90 he was Ambassador to the United States, then becoming Minister of Agriculture in the Japanese Cabinet. During the Ministry of Marquis Ito (1892–96) he was Minister of Foreign Affairs, being a member of the peace plenipotentiary party that arranged the treaty with Li Hung Chang at Shimonaseki, for which he was rewarded (1895) with the title of count. In 1894 he negotiated a treaty with Great Britain in which the latter renounced extra-territorial jurisdiction from July 1899. Lung troubles enforced his retirement from political activity in 1896.

MUTSUHITO, moo-tsu-hee-to, the 121st in the line of mikados or emperors of Japan and, according to the impersonality ruling in all Japanese history, posthumously called after the year-period, the Meiji Tenno: b. Kyoto, 3 Nov. 1852, 2d son of the Emperor Komei (1831–67), declared heir-apparent 10 July 1860; succeeded to the throne January 1867; inaugurated as sovereign, with the three imperial symbols, mirror, jewel and sword, 31 Oct. 1868; married 28 Dec. 1868 to Haruko, then 19, and the 3d daughter of the noble of the 1st rank Ichijo. No children were born of this union, but of the issue from imperial concubines, four sons and four daughters survive in 1918. From the first, brought up amid sounds of battle and in sight of the war fires of contending clansmen in Kyoto, as the old and new forces struggled for mastery, and, happily, early surrounded by men of vision and liberal minds, some of whom had been in Occidental countries, Mutsuhito was from the first in hearty and active sympathy with modern progress and civilization. One of his first public acts was to take the famous charter oath of five principles. In one of these he promised a national deliberative assembly, and in the other to seek for talent throughout the world for assistance in relaying the foundations of his empire. He became a shrewd judge of men and motives and a lover of peace. He signed in autograph the treaties, entered warmly into measures of reform and in erecting memorials to the martyrs and those who had advocated mikadoism and unity of government, traveled all over the empire to see his people, paid unique honors to his wife in public and private, and was a laborious servant of the nation. By personal tastes and habits thoroughly Japanese to the end of his days, he was a cosmopolitan in mind and sympathies, and his character as well as his office turned the scale in great crises, when grave debate was held by rival statesmen in his presence. Every word of the text of the constitution of 1889 was, during the two years of deliberation, discussed before him. Most notable and fiercely debated was the guarantee of religious liberty. His reign was marked by many wonderful events and a most extraordinary outburst of intellectual, industrial and military energy. On the 25th anniversary of his marriage, memorial postage stamps were issued and the empress was notably honored, marking a new era in the history of Japanese womanhood. The days of his last illness saw a prayer-meeting that was national and without regard to creed or class, all gods being petitioned, and the general sorrow was sincere and profound. His mauseoleum in Kyoto cost over $1,000,000. His consort, a true helpmeet and of finest character, followed him in death 8 April 1914. Both sovereigns were notable poets. From about 1870 the Japanese ceased to use the ancient poetical term mikado and adopted the native term tenshi, or tenno (son of heaven, or heavenly king), or emperor, as best according with the new status of Japan as a world-power. Consult Griffis, ‹The Mikado's Empire› (1909), and ‹The Mikado: Institution and Person› (1915); and Mrs. Fraser's ‹Letters from Japan› (1899).

MUTTON-BIRD, a sailors' name for the shearwater (q.v.).

MUTTRA, is the northwestern district of the Agra Division, United Provinces, lying between lat 27° 14′ and 27° 58′ N., and long. 77° 17′ and 78° 13′ E., with an area of 1,445 square miles. It lies on both sides of the Jumna and in the centre of the western border; the Arvallis Mountains extend in the form of a low range of hills. There are no rivers besides the Jumna, but there are canals, wells and marshes. The climate is hot and dry, with extremes of temperature. There is very slight rainfall. Muttra contains 14 towns and 837 villages. The population has been frequently devastated by famine, but better road facilities and irrigation have lessened these difficulties. About 90 per cent of the people are Hindus and less than 10 per cent are Mussulmans. The principal crops are millets, pulse, cotton, wheat, barley and sugar cane. The administration is under a member of the Indian Civil Service and three deputy collectors. According to Ptolemy, Muttra was the capital of the ancient kingdom of Surasena and was an important religious centre, as the many antiquities discovered here testify. It was sacked by the Mahmud of Ghazni in 1019, but played only a slight political part. It was revived during the Buddhist period as a centre of faith. Its history was merged into that of the Jats of Bharatpur, and after changing hands several times came under British dominion in 1803. In 1857 it mutinied but was put down in the same year and has since remained friendly. Consult ‹Gazetteer of India› (Vol. XVIII, Oxford 1908).

MUTUAL BANKS AND CO-OPERATIVE SOCIETIES. See Banks and Banking — World's Systems.

MUYSCAS, mū-ē′skä. See Chibchas.

MUZAFFAR-ED-DIN, moo-zä-fėr′ĕd-dēn′, Shah of Persia: b. Teheran, 25 March 1853; d. there, 9 Jan. 1907. He was governor of Azerbaijan; succeeded his father, Nasr-ed-Din (q.v.), 1 May 1896. Influenced by European civilization, he showed great tolerance toward the Christians, and did much to reform the internal administration of Persia by lightening taxes and by establishing a parliamentary government. He visited Europe several times.

MUZAKOVA, mŭ-zhă-kō′vá, **Johana.** See Svetla Karolina.

MUZIANO, moot-sē-ä′nō, **Girolamo**, commonly known as Bressano, Italian painter: b. Aquafredda, near Brescia, 1528; d. Rome, 27 April 1592. He was a pupil of Romanino (see Romanino Girolamo) and of Titian at Venice, and subsequently imitated Michelangelo. He was a skilled mannerist who could paint in any style while possessing none of his own. The Academy of Saint Luke was founded at his instigation. Among his most successful pictures are 'The Taking Down from the Cross,' in the Borghese Gallery, Rome; 'The Gift of the Apostolic Keys,' in the Vatican. There are also some frescoes of his still to be seen in the Vatican.

MY PRISONS ('LE MIE PRIGIONI'), one of Italy's most noted books, was written by Silvio Pellico (1789–1854) and published in Turin in 1832. The work is autobiographical, relating the 10 years' experience of the author, charged with conspiracy and condemned by the Austrian government, first to death and subsequently to 15 years of imprisonment in the prisons of Venice and Spielberg, near Brünn in Austria. The work itself is of the simplest character, written, as he says in his preface, to comfort unfortunates like himself by showing that under the most unfavorable conditions humanity is not as black as it is painted. Had Pellico aimed directly to expose the inhumanity and cruelty of the Austrian government, as might have been expected he would have done, his effort would likely have fallen far short of what he actually accomplished in doing just that in this pathetic tale of his sufferings borne with the utmost Christian resignation. No hatred nor vindictiveness toward his arrogant persecutors escapes the unfortunate victim. In fact it is just here that the recital is most open to criticism. The patient sufferer is too submissive, too long-suffering. Inoffensive and saintly as he is, that virility, which, because founded on righteousness, must ever command respect, is conspicuously lacking in him. His sad story awakened throughout Italy the most profound sympathy. Its moral effect may be compared to Chateaubriand's 'Genie du christianisme,' which was worth an army to Napoleon. Pellico's 'Le mie prigioni' was, as Caesare Balbo, who counseled the author to write the story, has said, worse for Austria than losing a battle. It is not primarily as an author that Pellico's place is secure in the hearts of his countrymen, for his literary work as a whole is rather commonplace, but as a Christian martyr upon whom an odious enemy has placed a crown of thorns. From the time of the appearance of this story, the hateful domination of Austria was judged and condemned by the fairminded not only of Italy but of Europe. Nothing has ever been written better adapted to cause and to perpetuate feelings of hatred toward a despicable tyrant. And even to-day the influence of 'Le mie prigioni' on Italian sentiment toward Austria is abiding. Many translations of 'Le mie prigioni' have appeared in many languages and English versions are easily procurable in the large libraries.

James Geddes, Jr.

MYCALE, mĭk'ạ-lē, Asia Minor, the classical name of the modern Samsun, a mountain of south Ionia, with the promontory of Cape Santa Maria opposite the island of Samos as its seaward termination.

MYCENÆ, mī-sē'nē, Greece, an ancient city of Argolis in the Peloponnesus, six miles northeast of Argos, built on a steep hill dominating the passes to Corinth. Its ruins since Schliemann's excavations in 1876 have yielded an abundance of archæological treasure of the greatest value and interest, illustrating the distinctive Mycenæan period of civilization, which preceded the culminating era of Hellenic culture. Mycenæ is said to have been founded by Perseus, and before the commencement of the Trojan War was the residence of Agamemnon, in whose reign it was regarded as the leading city in Greece; it was also the scene of the domestic tragedies of the house of Atreus (q.v.). It declined in importance after the invasion of the Dorians, but its cyclopean walls, citadel and other features, chief of which are the Lion's Gate, and the vaulted building of megalithic architecture called the Treasury of Atreus (q.v.), stood through succeeding centuries, and still stand, as monuments of its ancient grandeur and importance. Consult Schuchhardt-Sellers, 'Schliemann's Excavations' (1891); Hall, 'The Oldest Civilization of Greece' (1901); Tsountas and Manatt, 'The Mycenæan Age' (1897).

MYCORRIZA is a general name for a group of subterranean fungi that spread their growing, feeding part (mycelium) through the loose damp soil (humus) of the floor of a forest or wood-lot. They are symbiotic with a great variety and number of green-leaved plants, including forest trees of several families. The first root of one of these affected plants, just born from the seed, remains free, but as fast as the lateral roots push out they are enveloped in the mycelium of the fungus, and their ramifications become entangled in it as they spread, and this connection continues throughout life. Wherever a root or rootlet extends underground the fungus accompanies it. The mycelial filaments may form a dark-brown, felt-like coating over the whole surface of the root, or, in other cases, depending on the species, may make a net-work of spider-web-like mesh. At various points the spore-producing hyphæ proceed outward through the soil from the mycelium; they look like rootlets and seem to perform a similar service. This mycelium (called «spawn» by mushroom growers) represents an unknown number and variety of species of fungus, and it abounds in the humus of forests and uncultivated heaths where the top-soil is the result of vegetable decay. The coating of roots by this mycelium is to be seen wherever plants grow, but it does not affect every kind of plant. It is restricted to the flowering plants, among them all the *Pyrolaceæ*, *Vaccineæ* (whortleberries), and *Arbutae*, and most if not all the heath family (*Ericaceæ*), rhododendrons, daphnoids, a great number of conifers and all the *Cupuliferæ* — a group that includes the oak, beech, alder, chestnut and many other forest trees; also many isolated trees, as willows and poplars, and the genista and several other familiar garden herbs.

This association of the mycorrhiza with the flowering plants is in each case a partnership of mutual benefit. Covering the root with a mantle it prevents, it is true, the absorbing pores from performing their function of withdrawing from the soil the dissolved elements that constitute the food of the plant, but in compensation the fungus takes on itself this function, absorbing the required nutriment and delivering it to the plant. It is enabled to do this because the mycelium has the power of secreting «those special enzymes, or ferments which render soluble the organic ingredients they touch.» In return for this service it receives from the plant-root nourishment for itself, which has been elaborated in the leaves and distributed to every part of the plant, including its uttermost rootlet. This, indeed, is only following the custom of all fungi, which, having no chlorophyl with which to derive nourishment from the air through chemical dissolution and recombination, must get it from vegetable sources. This association of the mycorrhiza with plant-roots is therefore really a parasitism, yet it seems not only harmless but decidedly beneficial — in fact, those plants participating in this association will not do well, and perhaps will fail to grow at all, in a soil wholly free from suitable mycorrhiza. Hence the special value of the addition of wood-mold to garden or window-pot soil is that it brings with it this advantageous, and sometimes indispensable, mycorrhiza mycelium.

ERNEST INGERSOLL.

MYDDELTON, or **MIDDLETON**, SIR **Hugh**, British contractor: b. Galch Hill, Denbigh, Wales, about 1560; d. 10 Dec. 1631. He was by trade a goldsmith, banker and clothmaker of London, but became (1597) an alderman of Denbigh, then was elected member of Parliament for that town in the years 1603, 1614, 1620, 1623, 1625 and 1628. The lack of water supply for the rapidly growing city of London induced the Parliament to pass a bill for the construction of the «New River» to tap the springs in Hertfordshire, and he contracted to carry out the undertaking. Powerful opposition from the landed proprietors forced him to call in the king's aid and James I paid half the cost in return for half the profits. The canal, begun 1609, was completed in 1613 and was then 38 miles long, 20 feet wide, with a depth of but four feet. Until after his death the project was unprofitable and he lost considerably though the New River Company later became, after his death, one of the most profitable undertakings of centuries, its shares (known as «King's» and «Adventurers») being broken up in 30-second parts, bring immense dividends to this day. In 1617 he made considerable profit in the exploitation of lead and silver mines in Cardiganshire. He was created a baronet in 1622.

MYELITIS (from Greek μυελός; marrow), an inflammation, attended with more or less softening, of the substance of the spinal cord. It may be acute or chronic and is a rare disease. Some of the maladies formerly ascribed to chronic myelitis are now known to be due to chronic induration and thickening (sclerosis). The most common causes of myelitis are: irritation of the cord by fractured, dislocated or diseased vertebræ, by the pressure of a tumor, or by hemorrhage into its substance. The disease is aggravated by intemperate habits. It begins usually with pain or other uncomfortable sensations in the spine or extremities, and fatigue, followed by an uncertain gait, paralysis and very frequently death. There are four different forms of the disease according to the position of the inflammation, which may be in the midthoracic region, the most common form, or in the lumbar or lumbosacral region, in the cervical region or it may, instead of affecting only a certain definite locality such as those already mentioned, involve a number of small areas in the whole length of the cord and brain. This form is called disseminated myelitis. If the inflammation involves the upper part of the cord above the origin of the respiratory nerves, respiration is interfered with and death results from asphyxia. This is, however, exceedingly rare. If the inflammation exists lower down, in addition to the loss of motor power in the extremities the bladder and rectum may be paralyzed, the evacuations are discharged involuntarily and death occurs from exhaustion. The tendency of the inflammation is to spread. Treatment consists of salvarsan and mercury for the cases of syphlitic origin. Absolute rest in bed must be required, an air or water bed being preferable as bed sores are very likely to occur.

MYERS, Abraham C., American Confederate soldier: b. in South Carolina, 1811; d. Washington, D. C., 20 June 1889. When a boy he removed to Louisiana, was appointed to West Point, and in 1833 was graduated and entered the army. He served several years on the frontiers, in the War with Mexico, and then entered the quartermaster's department as lieutenant-colonel. When Louisiana seceded, Myers resigned and was soon appointed Confederate quartermaster-general with the rank of colonel. Myers rendered great service to the Confederacy in organizing its transportation and supply departments. On 10 Aug. 1863 he resigned. His life after the war was uneventful.

MYERS, Henry L., American legislator: b. Cooper County, Mo., 9 Oct. 1862. He was educated at private schools and practised law (1885–93) at Boonville and West Plains, Mo., then at Hamilton, Mont., from 1893. From 1895–99 he was prosecuting attorney for Ravalli County, Mont., becoming Democratic member of the Montana senate 1899–1903. He was (1907–11) district judge of the 4th Judicial District of Montana, becoming (1911–17), United States Senator for Montana, to which position he was re-elected for the present term (1917–23).

MYERS, Jerome, American artist: b. Petersburg, Va., 20 March 1867. He received his first art education in Cooper Union, New York, and also at the Art Students' League. In 1903 he won a Saint Louis Exposition bronze medal. His 'Night Mission' is in the New York Metropolitan Museum of Art and other works are in leading galleries of private collections. His favorite subjects are taken from local sources, New York's «East Side» especially.

MYGALE, the technical and book-name of the Theraphosidæ a species of trap-door spider (*Mygale avicularia*) which has been known to catch small birds and kill them. It is a native of India, Australia, Africa and South America. It is the largest of all the spiders, being very stout, dark brown or black in color, and its thick legs covered with hairs mingled with longer bristles. It builds its nest in trees. Similar species are brought into our ports in bunches of bananas. These spiders are nocturnal in their habits and feed usually on insects, but they do not hesitate to attack any living creature which seems unable to resist them. The fact that the bird-spider will actually kill birds and suck their blood was asserted by Madam Meriam in 1705. Her statements were received with doubt, but long after were verified by Bates. The specimen he observed on the Amazon River was nearly two inches in length, the legs expanding seven inches. He saw the monster on a tree-trunk beneath a deep crevice in the tree, across which was stretched a dense white web. «The lower part of the web was broken, and two small finches were entangled in the pieces; one was quite dead, the other was still living and was smeared with the filthy liquor or saliva exuded by the monster.» The natives call them *aranhas carangueijeiras*, or «crab-spiders.» The hairs on the body and legs come off when touched, and «cause a peculiar and almost maddening irritation.» This, Bates thinks, is not due to any poisonous quality residing in the hairs, but to their being short and hard, and thus getting into the fine creases of the skin.

MYIASIS, a diseased condition in humans caused by the larvæ of flies. House-flies may affect the skin of man by depositing eggs in wounds and on ulcerations, or may invade the external cavities of the body. The eggs hatch, and the maggots cause much local irritation and symptomatic fever; or in the case of the bot-fly (q.v.), penetrate the skin deeply and produce large abscesses. The maggots, as a rule, do not penetrate other tissues. The principal flies that infect wounds, etc., are the flesh-fly (blue-bottle), blow-fly, screw-worm fly, which deposits its eggs in the noses of persons who sleep unprotected during the day, and house-fly (qq.v.). Internal myiasis may result from swallowing the eggs of flies in raw vegetables containing them, and sometimes eaten in salads, when the resulting larvæ are got rid of by vomiting or purgation. Consult Howard, ‹The Insect Book› (1901).

MYLITTA, mĭ-lĭt'tạ, an Assyrian goddess, identified by the Greeks with Aphrodite. She was, as goddess of the moon, the female principle of generation.

MYLODON, the «ground sloth,» a genus of extinct edentate mammals, of sloth-like structure and large proportions, the remains of which occur along with those of the Megatherium and Megalonyx, in the recent or post-Tertiary deposits of South America and also scattered widely over the United States from Pennsylvania on the east to Oregon on the west. In size the *Mylodon robustus* — the most familiar species — attained a length, in some instances, of 11 feet. A large piece of the very thick hide of one of these mylodons, found in a cave in Patagonia, shows that they were covered with a dense coat of yellow-brown furry hair, similar to that of the brown bear of the Rocky Mountains. See GROUND-SLOTHS; MEGATHERIUM.

MYNA. See MINA-BIRD.

MYOPIA, mī-ō'pĭ-ạ, nearsightedness. See ASTIGMATISM; COLOR BLINDNESS; EYE; EYE STRAIN; VISION, DEFECTS OF.

MYOSIN, or **MYOSIN-FIBRIN**, a simple proteid substance, usually classed as a globulin (see GLOBULINS), which separates from muscle plasma after death, in the form of a clot, which is analogous to the clot of fibrin that is formed under similar circumstances in blood. Its average composition is carbon, 52.28 per cent; hydrogen, 7.11 per cent; nitrogen, 16.77 per cent; sulphur, 1.27 per cent, and oxygen, 22.03 per cent. It does not exist in the living muscle, being there represented by two other proteids called myosinogen and paramyosinogen, respectively. The stiffening of the muscles after death (technically known as the «rigor mortis») is due to the formation of the myosin-fibrin and myogen-fibrin clots in the cells of the muscles. Myosin is insoluble in water, but dissolves in dilute saline solutions. It is soluble also in dilute acids and alkalies, which convert it promptly into albuminates. Consult Hammarsten, O. (Mandel's translation), ‹A Textbook of Physiological Chemistry› (New York 1908).

MYOSOTIS. See MOUSE-EAR.

MYRES, mīrz, **John Linton**, English classical scholar: b. Preston, Lancashire, 3 July 1869. He was educated at Winchester and studied at New College, Oxford. From 1895–1907 he was tutor at Christ Church and lecturer in classical archæology (1903) at Oxford University, junior proctor (1904–05), secretary to committee for anthropology (1905–07) and examiner in final classical school (1906–08). From 1907–10 he was Gladstone professor of Greek and lecturer in ancient geography at the University of Liverpool, then Wykeham professor of ancient history at Oxford. He traveled through Greece and Asia Minor, conducted excavations in Cypress (1894 and 1913), and reorganized the Government Museum (1894). He has written ‹A Catalogue of the Cyprus Museum› (1899), in collaboration with Dr. Ohnefalsch-Richter; ‹A History of Rome› (1902); ‹The Dawn of History› (1911); ‹Handbook of Cesnola Collection of Antiquities› (in Metropolitan Museum of Art, 1914). He also wrote many papers on anthropology, geography and archæology for the scientific periodicals.

MYRIAPODA, a group formerly classified among the arthropodan animals, but now better known. It includes the groups of *Chilopoda*, or centipedes, and the *Diplopoda*, millepeds or galley-worms. The features common to all are the elongate worm-like body consisting of a head and behind this the trunk of numerous similar leg-bearing segments, not divided into thorax and abdomen. They are all habitants of dark and obscure places,— under logs and stones and the bark of trees. All but two species are terrestrial; those two are semi-aquatic, living between the high and low-water levels on the sea-coast. Closer analysis shows that the chilopods are related to the crustacea while the diplopods are allied to the worms. In the chilopods the head bears a pair of groups of simple eyes, a pair of antennæ and three pairs of jaws (mandibles, maxillæ, labium), while the first pair of trunk appendages becomes connected with the head and serve as poison-jaws. The trunk-segments are all similar, and each bears one pair of legs, the number of segments ranging from 15 to 170 or more. The body-segments are flattened and the reproductive openings are at the hinder end of the body. Most of the chilopoda are carnivoro

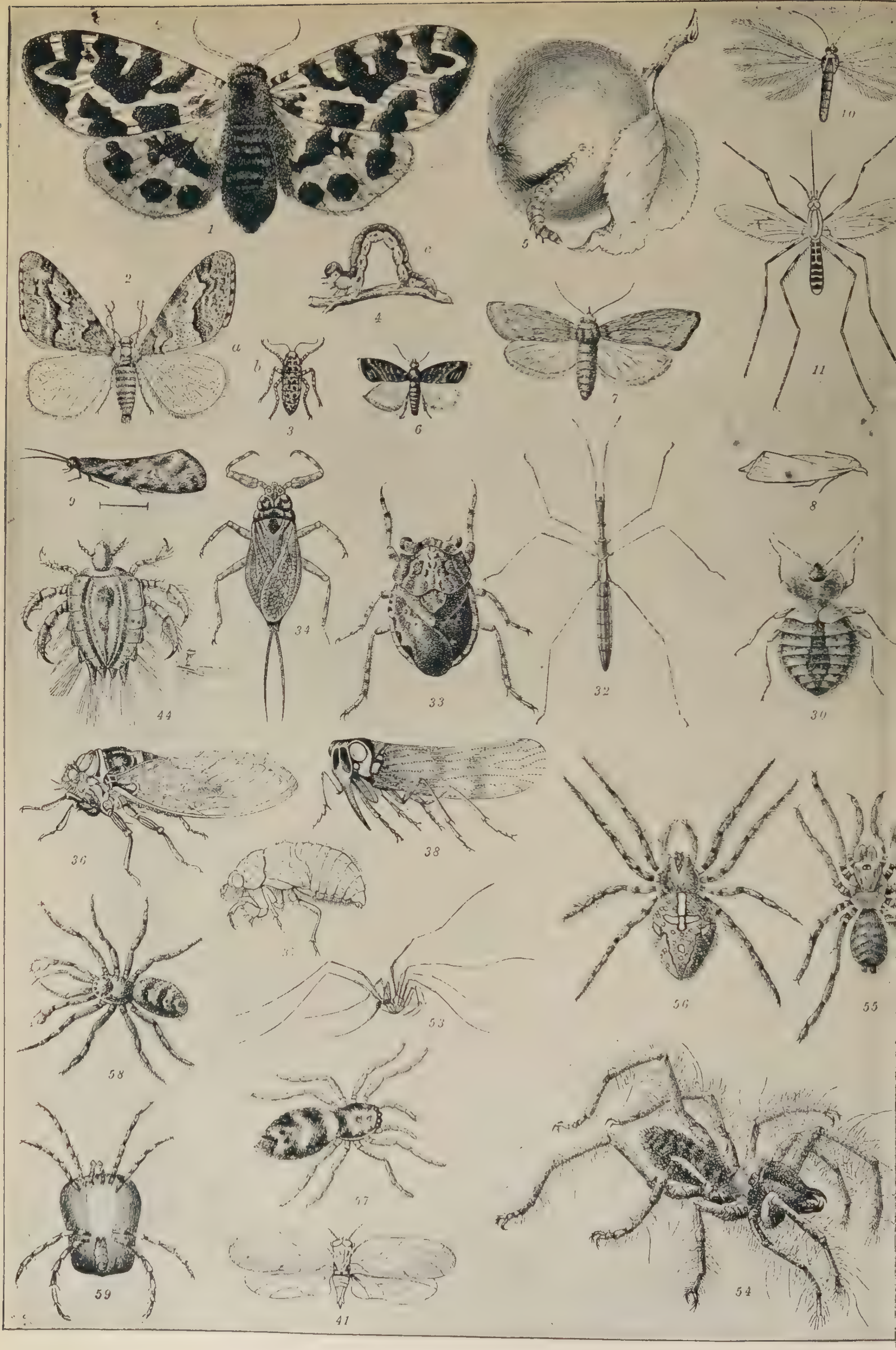
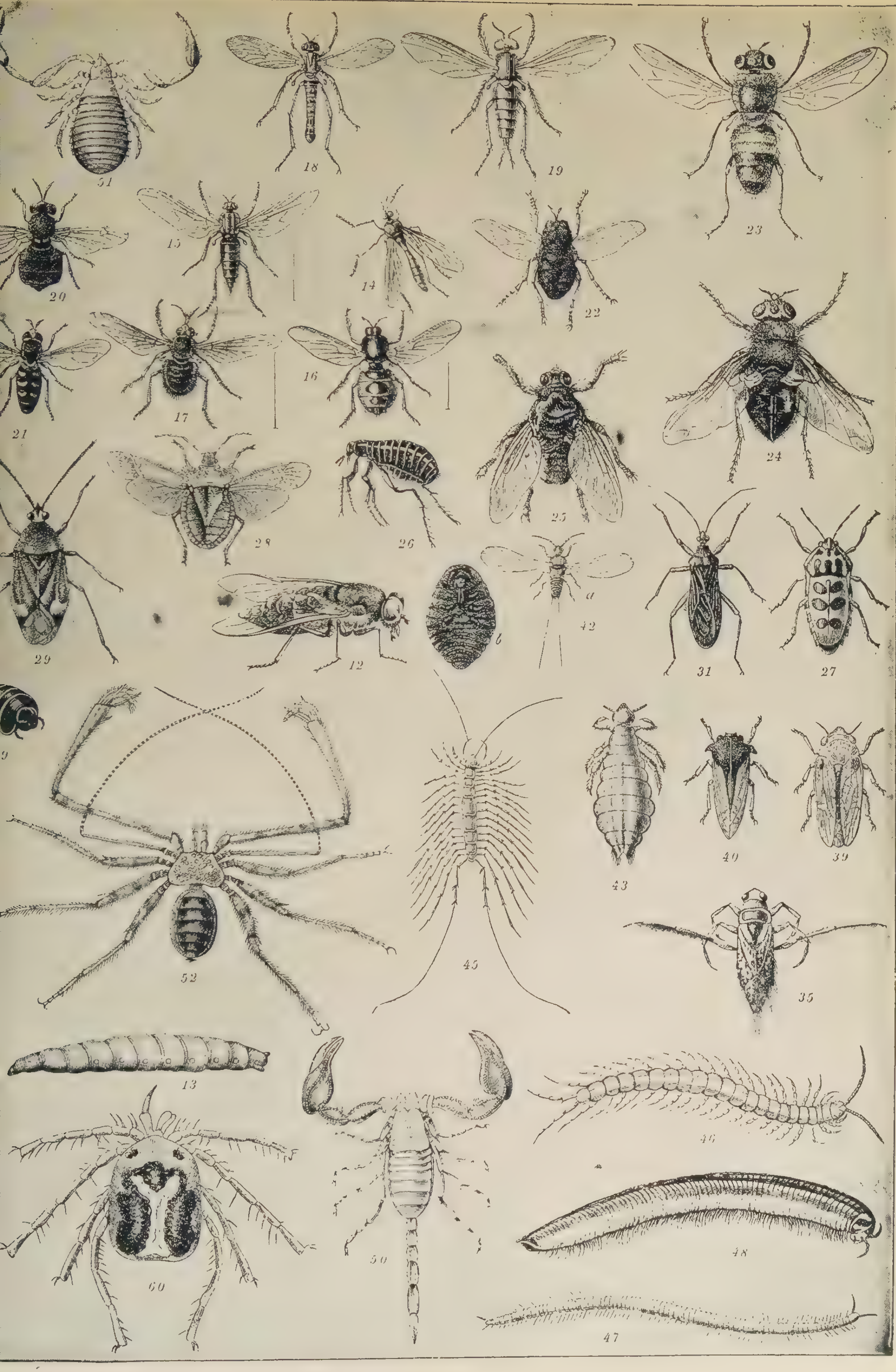


Fig. 1 Tiger-moth 2, 3, 4 Winter-moth — Male, Female, Caterpillar 5, 6 Apple-roller 7, 8 Honey-moth 9
16 Anthrax 17 Bombylius 18 Vermileo 19 Volucella 20 Stratiomys 21 Syrphus 22 Tachina
30 Common Bug 31 Reduvius 32 Water-flea 33 Bank-scorpion 34 Water-scorpion 35 W
41 Psylla Genistae 42 Cochineal, *a* Male; *b* Female 43 Louse 44 Crab-louse 45 Scutigera
52 Tarantula 53 Weaving Spider 54 Scorpion Spider 55 Mining Spider

A AND ARACHNIDA



noth 10 White-plume Moth 11 Ringed Gnat 12, 13 Breeze-fly and Larva 14 Hawk-fly 15 Leptis
t-fly 24 Blue-bottle 25 Forest-fly 26 Flea 27 Beetle-bug 28 Wood-bug 29 Phytocoris
nan 36, 37 Cicada and Larva 38 Burrowing Cicada 39 Frog-hopper 40 Centrotus Cornutus
lopendra 47 Millepede 48 Centipede 49 Pill-worm 50 Scorpion 51 Book-scorpion
den Spider 57, 58 Hunting Spider 59 Scarlet-mite 60 Water-mite

ous and ferocious and are very quick in movement. The most noticeable members of the group are the centipedes (*Scolopendridæ*) of the tropics, some of which are nearly a foot in length and have considerable poison powers. See CENTIPEDES.

In the diplopoda the head bears but two pairs of jaws (mandibles and lower lip or gnathochilarium), while the trunk-segments are usually circular in section, and each, except a few near the head, bears *two* pairs of legs, an exception to the otherwise universal rule among arthropoda of a pair of legs to a somite. The range of segments is even greater than in the chilopods, there being nine in *Pauropoda* and 200 in some *Polyzoindæ*. The reproductive organs lie ventral to the intestine, and the external openings are a little behind the head. The *Diplopoda* live mostly upon decaying vegetation and are extremely slow in movement. For protection they rely upon the very thick and hard walls of the bodies, and in some species upon peculiar stink glands which open on the sides of the body. See MILLEPED.

Fossil Myriapods appear in the Devonian rocks and they are found in all parts of the world to-day. Most of the American species are described in Bollman's ‹Myriapods of America› (United States National Museum, 1893).

MYRICIN, a substance formed by the combination of palmitic acid with an organic radical known as «myricyl.» It has the chemical formula $C_{30}H_{61}$.O.CO.$C_{15}H_{31}$, and occurs in beeswax, forming the chief portion of that part of the wax which is insoluble in alcohol. Myricin melts at 162° F., is readily saponified by alcoholic potash, and may be obtained in the form of feathery crystals by deposition from its solution in ether.

MYRISTIC ACID, an organic acid occurring in the form of a glyceryl ether in nutmeg butter, from which it may be prepared by saponification and subsequent distillation at a pressure materially below that of the atmosphere. It is a component also of butter, wool fat, cocoanut oil and oil of quince seed. It has the chemical formula $C_{13}H_{27}$.COOH, and is insoluble in water. It is very soluble in hot alcohol, however, from which it separates, upon cooling, in the form of lustrous laminæ, melting at 129° F., and boiling at 250° F. It may be prepared by melting stearolic acid with potash. A number of compounds of myristic acid with the metals are known, as well as several ethers and other organic compounds. Myristic acid gives their characteristic name to the myristica fats of which it forms the predominating part as trimyristil glyceride.

MYRMECOPHILY, in its broadest sense, signifies a condition of friendship with ants, and includes the subject of the various insect and other guests kept or entertained in their nests by ants. The side of it to be considered now, however, is the relation of certain plants to ants, when this relation is, or is supposed to be, of mutual advantage. Such plants are termed myrmecophilous and are of great variety, especially in the tropics. That ants inhabit all sorts of cavities in trees and large vascular plants, such as cacti, is well known, and often they dig out the pithy interior or otherwise modify these cavities into homes fully adapted to their requirements. «The rigid vegetable tissues are an excellent protection against enemies,» as Wheeler points out, «and the cavities are moist, dark and free from molds, so that they make perfect nurseries for the larvæ and pupæ.» It is a matter of common knowledge also that in most cases the plants thus utilized furnish a good deal of food-material for the ants. The great mass of observations bearing on this matter have been interpreted by many naturalists to support the view that many plants have developed as an adaptation through natural selection elaborate structures to be used as ant-lodgings or even to furnish these insects with food-substances in order to attract certain pugnacious ants whose stings are formidable, because they will protect the plants from leaf-cutting ants or other leaf-destroying enemies. In this alleged symbiotic arrangement the insects profit by the supply of special food-material growing on the plant and return the service by warding off harm; and it is said that mutual adaptations have occurred between the chosen kind of plant and the species of ant that inhabits its appointed cavities. The great body of facts collected by Fritz Müller, Schimper, Belt, Semper, Beccari and others are accepted, and some of their interpretations are admitted, but recent students of the matter regard the theory as far overstrained and doubt that true symbiosis can be shown to exist in any case. The latest and fullest treatment of the matter will be found in William M. Wheeler's ‹Ants› (New York 1910).

MYRMIDONS, mėr'mĭ-dŏnz, a former people on the southern borders of Thessaly, who accompanied Achilles to the Trojan War. They were said to have received their name from Myrmidon, a son of Zeus and Eurymedusa, the daughter of Cleitos, whom Zeus deceived in the disguise of an ant. He was married to Peisidice by whom he became the father of Antiphus and Actor. For Æacus, a descendant of this branch, Zeus changed the ants of the island of Ægina to men. This legend was the origin of the belief that the Myrmidons emigrated to Thessaly under the leadership of Peleus.

MYROBOLANS, the dried fruits of various species of East Indian trees, all having more or less astringent properties. They are used for dyeing and tanning, especially the latter. The trees are of the genus *Terminalia,* family *Combretaceæ,* the chief being the belleric myrobolan (*T. bellerica*), and the chebulic (*T. chebulica*).

MYRON, Greek sculptor: b. Eleutheræ, a seaport of Bœotia, about 450 B.C. He was, along with Phidias and Polycletus, a pupil of Ageladas, the founder of the Peloponnesian school of sculpture, and made his renown at Athens as a versatile and masterly worker in bronze, silver and every other art material. He executed statues of gods, heroes and especially of athletes, many of which were set up in the temples at Delphi and Olympia. The most celebrated among them was that of swift-runner Ladas, and the Discobolus, or hurler of the discus, a work of art highly admired by the Romans, as is proved by the many Italian copies of it made in marble, the finest of which is that now in the Lancelotti Palace, Rome. On medals, basins and reliefs there are still extant copies of his Athenian work, ‘Athene Throwing Away the Flute,’ etc. A marble copy of his ‘Marsyas’ is in the Lateran Museum at Rome, and one in bronze is to be seen in the British Museum. He was equally successful in the representation of animals. His ‘Cow’ in the market at Athens was the subject of many a laudatory epigram and was brought to Rome in the time of Cicero. Myron gave a somewhat exaggerated slenderness to the human form, which he modeled with exquisite beauty and anatomical accuracy, but was not a master of facial expression.

MYRRH, a popular name for a gum resin produced by *Commiphora myrrha* of the family *Burseraceæ;* also for a garden plant *Myrrhis odorata* of the family *Apiaceæ.* The resin is obtained from Arabia and adjacent Africa from a small, prickly, stunted, gray-barked tree which bears few small denticulate leaves and smooth, brown, egg-shaped drupes as large as currants. The drops, granules or tears which in commerce are brown, red or yellow are at first rather oily, yellowish and soft, becoming brittle with age. They have a pleasing balsamic odor and lasting, bitter, aromatic taste. From earliest times they have been used for making incense and other perfumes and have been reputed useful in medicine, especially for cleansing the mouth and sweetening the breath.

Myrrh, the garden plant, also known as sweet cicely, has been cultivated for ages as a sweet herb for flavoring salads and culinary preparations. It is little grown in the United States except by people of rather recent European ancestry.

MYRTACEÆ, a family of trees and shrubs, the myrtle family, comprising about 70 genera and more than 2,000 species widely distributed in warm climates, but sparingly in temperate. It is one of the most important families of economic plants. Some of the species, such as pomegranate (*Punica granatum*), guava (*Psidium spp.*), luma and ugni (*Myrtus*) yield important fruits; some such as cloves (*Eugenia sp.*), allspice (*Pimenta*), furnish highly valued spices; and still others, especially species of *Eucalyptus,* are leading timber trees of the world. The species are characterized by simple, entire leaves generally dotted with glands; perfect flowers in racemes or sometimes cymes, and various kinds of fruits. See Myrtle.

MYRTLE, a popular name for several unrelated plants of which the following are probably the best known: Crape myrtle (*Lagerstrœmia indica*) of the family *Lythraceæ;* running myrtle (*Vinca spp.*) of the family *Apocynaceæ;* sand myrtle (*Leiophyllum spp.*) of the *Ericaceæ.* When unqualified the name generally refers to various species of *Myrtus* of the family *Myrtaceæ.* The common myrtle (*M. communis*) is an evergreen shrub native of the Mediterranean region and western Asia, whence it has been introduced into gardens throughout the warmer temperate climates of the world for its foliage and flowers. It was used in Greek festivals as sacred to Venus and as the symbol of beauty and youth. Its aromatic leaves and berries were formerly used in medicine and its bark in tanning, uses still made of them to some extent in southern Europe. The small leaved myrtle (*M. microphylla*), the luma (*M. luma*) and the Chilean guava (*M. ugni*) yield edible fruits, for which they are planted in South America and to some extent in California.

MYRTLE TREE. See Beech.

MYSIA, mĭsh'ĭ-ȧ, Asia Minor, a name anciently applied to a district which varied greatly in extent at different periods. The name first occurs in the legend of Telephus, who became king of Mysia. Under the Persian Empire Mysia was the name of the section between Lydia on the south and the range of Ida on the north. It was united with the region on the north and with Lydia in forming a single satrapy. After the overthrow of the Persian Empire by Alexander the Great, Mysia fell to Lysimachus (311 B.C.). Subsequently it formed part of the Græco-Syrian kingdom, then of the kingdom of Pergamus, and finally, in 133 B.C., was bequeathed with the rest of the kingdom of Pergamus, by Attalus III to the Romans, by whom it was made a part of the province of Mysia. When the divisions of Asia Minor were settled under Augustus, the name of Mysia was given to the whole of the northwestern district, bounded on the north by the Propontis (Sea of Marmora), east by Bithynia and Phrygia, south by Lydia and west by the Ægean Sea. Under the later empire Mysia was erected into a separate proconsular province and received the name of Hellespontus. The inhabitants were thought by some ancient writers to be of Thracian or Lydian descent.

MYSORE, mī-sōr', or **MAISUR,** mī-soor', India, the dynastic capital of the native state of the same name, 250 miles west by south of Madras, in a valley 2,450 feet above sea-level, dominated on the southeast by Chamundi Hill 1,040 feet higher, with a temple on its summit. It is on the Mysore State Railway. Modern enterprise on European methods has greatly improved the town. The streets are broad and regular, the houses intermingled with trees and temples, and there are several fine modern public buildings, including the British residency. The fort built in European style, and separated from the town by a promenade, encloses the maharaja's palace, and the dwellings of his officials.

MYSORE STATE, or **MAISUR,** a native state in Southern India, lying between lat. 11° 36′ and 15° 2′ N. and 74° 38′ and 78° 36′ E. Its area is 29,433 square miles; the greatest length north and south being about 230 miles; east and west about 290 miles. It is bounded by Madras districts on all sides except on the northwest where it is bordered by two Bombay districts and toward the southwest where Coorg intervenes. It consists of an undulating table land, much broken up by chains of rocky hills and scored by deep ravines. Its form is that of a triangle with the apex to the south at the point where the western and eastern ghāt ranges converge in the group of the Nilgiris. The general elevation rises from about 2,000 feet along the north and south to about 3,000 feet at the watershed which separates the basin of the Kistna to the north from that of the Cauvery to the south. Isolated rocky peaks called «droogs» appear on all sides at an elevation of from 4,000 to 5,000 feet. The drainage of the country finds its way east to the Bay of Bengal and there are three great river systems; the Kestna on the north, the Cauvery on the south and the Penner, Ponnaiyār and Pālār on the east. None of these is navigable, but they are sometimes used for floating lumber. They support an extensive system of irrigation by means of channels formed by immense dams, these channels tracing a course of more than 1,200 miles. There are no natural lakes in Mysore, but by embanking streams, tanks or reservoirs of all sizes are formed numbering some 30,000. Mysore is divided naturally into two regions: the hill country or Malnād on the west — a picturesque mountain land, with fine forests — and the open country on the east comprising the greater part of the state, known as Maidān or Bayalshīme, where the towns are located. The products of the country vary with the water supply and nature of the locality. The level plains of black soil in the north grow cotton or millets; the tracts in the south and west are covered with plantations of sugarcane and rice; the lands irrigated from tanks yield coco-nut and areca palms; the red soil in the east produces rāgi and dry crops; the central parts covered with areas of coarse grass relieved by shady groves, are good for grazing. The principal mountain ranges besides the Ghāt ranges are the interior range, from 10 to 20 miles wide running between 77° and 77° 30′ E. to the frontier; and a corresponding range in the west. The highest point is Mulainagiri, at an elevation of 6,317 feet. Granites and granite gneisses of the Achæan occupy the greater portion of the state and traversing these are metamorphic schists of Pre-Palæozoic Age. There are other more recent deposits. Granite exists in large irruptive masses. Wild animals and reptiles are abundant in the forests and streams of the south. Large fish are found in the west.

There are three seasons, rainy, cold and hot. The country is visited by two monsoons, the southwest, from June to November, followed by the cold season. The temperature ranges from 64° to 84° in the rainy season; and from 51° to 80° during the cold season. In the hottest season it ranges from 66° to 91°, rarely reaching 96°. The rainfall varies from 19 inches in the north centre to 360 inches on the crest of the Western Ghāts.

Mysore yields 95 per cent of the gold of India. Iron is found in small quantities and asbestos is an undeveloped industry. The manufactures consist of fabrics, silk and carpets, gold ornaments, copper vessels. Sandal wood carving is extensively carried on. Coffee, cotton-ginning, bricks, tiles, etc., are also among the manufactures. A system of railways radiates from Bangalore; the length of the railway open to traffic in Mysore is about 500 miles. For postal services, Mysore is now part of the Madras circle. There are Mysore state savings banks and life insurance companies. Famine, due to lack of rainfall, has often carried off many of the people, but measures have been taken to alleviate this condition, such as the extension of railways, irrigation and plans for relief work.

The government is vested in His Highness the Mahārājā, a chief justice and a court of three judges. The capital is at Mysore City, but the administrative headquarters are at Bangalore. The administrative districts of the state are Bangalore, Kolār, Tumkūr, Mysore, Hassan, Spimoga and Chitaldroog. The officer in charge of a district is called the deputy commissioner who has a staff of assistants. The villages have local government under a pātel, a hereditary office. A representative assembly meets once a year, when the annual statement of finances is made. The government of India is represented by a resident. There are military systems, lesser courts, systems of land tenure and revenue, police departments, etc. Education was at first introduced by European missionaries and has been developed into a fine public system. There are now about 3,800 schools of all grades with some 125,000 male and 25,000 female students. Hospitals and asylums are also provided in the larger cities. The population of the entire district according to the most recent census is 2,871,572. Hindu castes predominate the Lingayats forming the strongest sect. There are about 50,000 Christians, about 8,000 of whom are white. The principal cities are Bangalore, Mysore, Kolār, Tumkūr, Channapatna, Davangere and Tarikere.

The authentic history of Mysore as gathered from inscriptions, begins after the invasion of Alexander the Great in 327 B.C. After his retirement the north of Mysore came under the rule of the Andhra of Sātavāhana dynasty, extending down to the 2d century B.C. The various parts were under petty local princes who were frequently at war with each other, until in the 14th century the territory became a part of the Ballala Kingdom of Delhi, after the invasion of the Mohammedans. After their downfall a new Hindu sovereignty arose at Vijayanagar on the Tungabhadra. In 1565, this dynasty was defeated at the battle of Talikota and petty chieftains again divided up the state. The most important of these, the wedeyar of Mysore, seized the fort of Seringapatam in 1610 and founded the present state. Under Deva Raja it became a powerful kingdom. In the 18th century this dynasty was overthrown by the Mohammedan Hyder Ali, who, after a brief but brilliant reign, was defeated at Seringapatam in 1799, and the government was left to an infant descendant and an unscrupulous regent, Purnaiya. The British government took over the administration in 1831. In 1867, it was determined to permit the native rule, under British surveillance. In 1881, Maharaja Chamarajendra took the rule of the state, maintaining the standard of administration. In 1902 the ruler was vested with full powers. Consult 'Imperial Gazetteer of India' (Vol. XVIII, Oxford 1908).

MYSTERIES (Latin *mysterium,* from Greek *mystes,* initiate) — in ancient history, were among the Greeks, and afterward also among the Romans, secret religious assemblies, in which no uninitiated person was permitted to take part. They originated at a very early period. They seem to have had a double object — first, that of handing down the traditions relating to the divinities in whose honor they were celebrated; and secondly, that of teaching and practising religious rites. The true value of the mysteries did not lie in dogmatic teaching, but in the moral improvement apparent in the votaries, in the comfort the rites gave in the present life, and the hopes they inspired for the world to come. The most important Greek mysteries were (1) the Eleusinian; (2) the Samothracian, which were celebrated in honor of the Cabeiri in all the places where these divinities were worshiped. (3) The Dionysia, at Rome called Bacchanalia, which were celebrated in honor of Dionysus or Bacchus. These latter mysteries were of so licentious a character that they were first forbidden in Thebes, and afterward in all Greece, as prejudicial to the public peace and morals. This was likewise done in Italy by a decree of the Roman senate in 186 B.C. (See BACCHUS). (4) The Orphic, consecrated to Dionysus Zagreus, the son of Zeus and Persephone. (See ORPHEUS). See also MIRACLE PLAYS.

Eleusinian Mysteries were generally held by the Greeks to be the most sacred of all the mysteries; and their great secrecy, intricate ritual and dramatic features were undoubtedly strongly influential in shaping the form of the ritual for many succeeding secret orders. They were connected with the worship of Demiter and Cora at Eleusis in Attica; and they appear to have had their origin in the ceremonies connected with the birth and death of the grain spirits. Demeter, in the ceremonies of initiation through which the candidate had to pass in order to become a member of the mysteries society, finally bestows agriculture upon man. The mysteries seem to have had degrees suggestive of the degrees in modern secret societies. All candidates had to become members of the society of the Lesser Mysteries at Agræ (near Athens), before they could enter that of the Greater Mysteries at Eleusis; and six months had to elapse between the two initiations. At both initiations the candidate made his own personal offerings or sacrifices to the gods, accompanied by fasting and other ceremonial practices in the nature of purifications; after which he wandered, or was led, through dark and intricate passages until finally he emerged into the presence of the deity upon whom streamed the light. As the Lesser Mysteries were celebrated in the early spring and the Greater Mysteries in the fall, the first probably represented the coming to life of dead nature and the latter the death of vegetation. A sacred peace declared some days previous to the opening of the ceremonies and continuing several days after their close permitted the pilgrims to the shrines and the candidates to come and go in peace, without any fear of molestation. The public ceremonies of the Greater Mysteries began with the bringing from Eleusis to Athens of certain sacred relics to be placed in the Eleusinia; the following day the celebrants put in an appearance and on the third day all the initiates (Mystæ) marched in procession to the Phalerum beach where they performed the necessary ceremonial bathing which was symbolical of purification. This was followed by two days devoted to offerings presented at various shrines throughout Athens. Early on the morning of the next day the relics were returned to Eleusis, escorted by a great religious procession, in the midst of which was the image of Iaccus. This occupied all day. The following four days and nights were given up to the secret ceremonies of the mysteries, under the direction of the Hierophant, the Dadouchos (torchbearer), the Hierokeryse (herald) and the officiating priest. Eleusinian mysteries were also celebrated in various other places in Greece proper and outside of it, among these being Megalopolis, Phlius and Andania (in Messenia). The mysteries undoubtedly dated back to considerable antiquity, far as the earliest notice we have of them, they are possessed of an organized priesthood and the custom of choosing the Hierophant from one family (the Eumolpidæ of Eleusis), and the Dadouchos from another (the Kerykes). It is probable that these families, in early times, derived their family names from their offices, as the Jewish priests did.

Samothracian Mysteries. These which were originally two, were known as those of the Cabeiri. In the course of time they became four, Axieros, Axiokersa, Axiokersos and Kasmilos, in popular phraseology; though the grammarians identified them, respectively, with Demeter, Persephone, Hades and Hermes. It seems probable that they were the survival of tribal deities belonging to the same great family religion.

Gradually as time went on these mysteries, which had much of the spectacular and the mysterious which always appeal to humanity, spread throughout Greece, in their own form and under their own name or in the shape of evident imitations or of other closely related tribal mysteries. The worship of the Egyptian moon and mother goddess, Iris, which had early been introduced into Greece, spread rapidly throughout all the land round the Mediterranean and later into the cultured sections of western Asia. With this worship came foreign mysteries, which seem to have originated in the same form of nature worship as the native Greek mysteries. Other foreign mysteries, apparently also of similar origin, were introduced into Greece and appear to have taken root there. The Greeks seem to have been very fond of these semi-religious, semi-social mysteries and most of the prominent citizens appear to have belonged to one or more of them, much as people to-day belong to secret societies. The mysteries, however, had a deep meaning for the Greek, which the modern secret society does not have for its members.

Bibliography.—Aurich, ‹Das antike Mysterienswesen in Seinem Einfluss auf das Christenthum› (Göttinger 1894); Fairbanks, ‹A Handbook of Greek Religion› (New York 1910); Farnell, L. R., ‹Cults of the Greek States› (Oxford 1906); Foucart, ‹Recherches sur l'origine de la nature des mystères d'Eleusis› (Paris 1895); Gardner, E. A., ‹New Chapters in Greek History› (London 1892); Gruppe, O., ‹Griechische Mytologie und Religions geschichte› (Munich 1906); Harrison, J. E., ‹Polegomena to the Study of Greek Religion› (Cambridge 1908); Lang, A., ‹Myth, Ritual and Religion› (London 1887); Lobeck, C. A., ‹Aglaophamus› (Königsberg 1829); Mommsen, L., ‹Feste der Stadt Athens› (Leipzig 1898); Nebe, ‹De Mysteriorum Eleusiniorum Tempore et Administratione Publica› (Halle 1886); Petersen, ‹Der geheime Gottesdienst bei den Griechen› (Hamburg 1848); Rohde, ‹Psyche› (Leipzig 1902); Stube, ‹Bilderkreis von Eleusis› (Leipzig 1870–72);

Tucker, F. G., ‹Frogs› of Aristophanes (London 1906).

MYSTERIES OF UDOLPHO, published in 1794, is the best known of the several novels of Mrs. Ann Radcliffe (1764–1822). The book was exceedingly popular at the time, the author receiving the unusual sum of £500 for it, and it was translated into French. Though the novel to-day is usually cited as an example of the florid, romantic style of the later 18th century, it is as a matter of fact an interesting and in many respects a powerful novel. It tells the romantic history of a young French lady, Emily d'Aubert, a heroine of much sensibility, but of considerable character, who has many trying and mysterious adventures in France and in Italy, and her marriage to the hero, Valancourt. The plot is an intricate and eventful one and the story deals with kind parents, unkind relatives, fine feelings, rude behavior, ruffians, and with mysteries, both of character and of circumstance, which are ultimately explained as natural. Perhaps the most distinguished parts of the book are the fine and often beautifully poetical descriptions of nature. The characters are less interesting in that nearly all seem to the modern reader to be unreal and melodramatic. The novel contains many good poems by Mrs. Radcliffe in the 18th century style. The tale is high in its class, but was, of course, overshadowed by the greater power and popularity of the Waverly novels, which owe something to it.

William T. Brewster.

MYSTERY OF EDWIN DROOD, novel by Charles Dickens. It was the last work by this noted author and was never finished. Only eight numbers appeared, which were published in 1870, the year of the author's death. Numerous conjectures as to the outcome of the plot started or have been published from time to time, but his notes for the continuation of the work lead little toward unraveling his intent.

MYSTIC SHRINE, Ancient Arabic Order of Nobles of the, an order said to have been founded at Mecca in the year of the Hejira 25. The American order is composed only of Knights Templar and 32d degree of the Ancient and Accepted Scottish Rite, Masonic Order. The governing body is the imperial council with 101 subordinate branches called temples. The membership in America amounts to 200,500. See Masonic Fraternity.

MYSTICISM, mĭs'tĭ-sĭz'm, a term derived from the Latin *mysticus,* Greek *μυστικός* mystical, secret, from *μυστης* a mystic, one initiated into mysteries, and from *μυξιν*, to close the lips or eyes. Mysticism has for many minds a repellent sense, owing, as a recent writer has acutely observed, to its association with the delusions of visionaries and the extravagance not only of gnostics and Neoplatonists, but of many so-called Christian mystics, who, misled by a resemblance in terminology and statement, as well as in practice and discipline between the false and the true, have failed to observe a difference of infinite movement in principle and substance, and have striven to mingle into one system utterly antagonistic elements. Against extravagances such as these common sense has justly rebelled, while philistinism has found in them a pretext for making a clean sweep of everything that would seem to raise religion above the plain man's apprehension and criticism.

For many, mysticism means simply an abandonment of all attempt to reconcile the «religious sentiment» with intelligent thought, a deliberate yielding of one's self to any unchecked and unverifiable fancy or speculation which seems to interpret the vague yearning of the soul after a transcendent being. Or it suggests a morbid quietism effected by a complete deadening of the affections and stupefaction of the mind, an Oriental contempt not only for everything material and natural, but even for all desire and existence; thus giving a Buddhist interpretation to the Christian discipline of self. Or at best the term stands for the exalted state of a few saint-like beings who have attained to a preternatural state of communion with the Deity, a state that has no practical interest to the ordinary mortal. But merely to tabulate the countlessly divergent senses associated with the term, not only in common usage but by authors of high repute, would exhaust the limits of the present article. The reader interested in the matter can consult some such work as that of Mr. Inge, mentioned below. One reason for the great discrepancy of usage has been already suggested. The confusion results mainly from the failure to view mysticism objectively in its ultimate meaning and relations, its origin and finality; an omission on which has followed a confusion of a primary and an essential property of human nature with one or other of its merely contingent modifications or partial tendencies; and thus abnormal and insane phenomena have come to be associated with a term which radically expresses the deepest movement and loftiest aspiration of man's being.

Like all other words of similar structure, the term mysticism connotes both a tendency or a realized experience, and a theory conversant therewith. For the sake of brevity the former acceptation may be here subsumed under the latter. The finality inherent in all creation — a tendency so imminent in nature that the effort to explain it away by reducing it to merely mechanical motion is impugned by the very ideas and terminology in which the attempt is conceived and expressed — reaches its highest expression in man's nature. Whether it be viewed as a process of natural selection, an adaptation to environment, a part of the struggle for existence, or under any other biological metaphor, this tendency to a purpose is as essentially — nay, surpassingly more so — a property of man as it is of any of the lower forms of life, vegetable or animal. If it be asked what is this purpose, this goal to which man ever presses, the answer may be given in terms of universal significance, that ultimately it is the realization of the plan of the universe. To this end, however, man strives unconsciously, and in a certain sense mechanically and involuntarily. Proximately, on the other hand, man is forever seeking self-realization, the development of his total self. This self, however, is perfected only in and by the exercise of its highest activity, and that activity can reach its complete perfection only when directed to and exercised on its highest object. Now man's highest activity to which all other forms of energy within him are subordinate is mental, intellectual and volitional, and the highest object answering thereto is the True and the Good. The true as perfective of the intellectual side of human nature is identified with the Good as it satiates the appetitive or conative side, and both are concretely realized only in the Supreme Being, the Infinite, the Absolute, God. Now the mystic is one who, whether explicitly or implicitly, recognizes this essential relation of his nature to God and strives to adjust his life accordingly. It may of course be said that this is a conception of mysticism in the abstract, as seen from some transcendent viewpoint of man's personality, but not of mysticism in the concrete, as it occurs in actual life and history. In some measure this may be admitted. On the other hand it is the conception realized in those who have lived it out in the sanest form and the most perfect degree, and is inapplicable only in the case of those who directing their energies to some one or other partial object; to an object answering to only individual tendencies of their nature, to the neglect of the demands of their complete selves, have thrown their lives into disorder and confusion and have brought mysticism into obloquy and derision.

It is almost impossible to make any classification of mysticism that shall be adequately comprehensive. For the purposes of this article it will suffice to consider it as a rationalistico-natural or purely philosophical, and as a Christian-theological or primarily religious experience and theory; though these distinctive qualifications are far from being mutually exclusive; on the contrary they overlap at more than one point. Christian mysticism is substantially *philosophical* and of course rational; but it introduces a supra (not contra) rational element. On the other hand what is here called *rationalistico-philosophical* mysticism may and does with many of its disciples include Christian doctrine and practice, and in so far may claim the latter title. For the rest the distinction will become plainer from what follows.

I. Rationalistic Mysticism.— As a philosophical theory this attributes to the human mind the natural ability to rise to an immediate intuition of the Absolute, that is, God, and therein and thereby to an intuition of all truth. This immediate vision whilst reflective and contemplative is not attained so long as the mind remains on the lower level of ordinary discursive reasoning. Such thought being, it is claimed, confined to the sensible, to empirical phenomena, cannot attain to higher ideal truth. To contemplate the Absolute, man must withdraw his mind from the world of sensuous phenomena, inhibit all discursive activity, and concentrate his mental energy. As the mind escapes from the mists of earth the rising light of a higher vision is felt. In that vision the lower cognitive powers become inactive, the very consciousness of self is obliterated and the mind is absorbed in ecstasy. The ecstatic state is a condition pre-required for the contemplation of the Absolute. This state, however, is attained only through ascetic practices and he alone who reaches its heights is enabled to contemplate pure ideal truth and manifest it to others as he has perceived it. In ecstasy, moreover, the mind becomes interpenetrated, even identified with God. Nay more, ecstatic vision is one and the same with the act in which the Deity contemplates His own self: «the eye with which the ecstatic sees God is the eye with which God sees Himself.» Philosophical mysticism thus terminates in pantheism.

II. History.— The birthplace of this form of Mysticism is the Orient. Brahmanism (q.v.) is a finished mysticism. For it Brahma is the sole existent. What is is Brahma, and what is not Brahma is nothing. Things mundane are distinct neither from Brahma nor from one another. They are simply modifications of Brahma. So long as the mind conceives of them as distinct it is in a state of delusion. From this delusion it must free itself by penetrating into the vision of the unity of all things in Brahma. To this end man must perform works of penance and sacrifice, cut himself loose from the sensile and sensuous world, and by concentration of his entire physical energy absorb himself in the All; that is, lay aside all self-activity and allow the One alone to work within him. Then will the light of vision rise on his mind and in everything he shall see the Brahma, the eternal self-existent One, the All. Oriental mysticism was transplanted to the West by the Neoplatonists in the form of emanational pantheism. God is here the primal One and the primal Good; from Him emanates directly the νοῦς (*Nous*) wherein are contained the ideas of all things and from which proceeds the world-soul. The human mind is in turn an emanation from the world-soul and, remaining essentially included therein, it lives in essential connection with the *Nous* even as the latter remains in essential union with the primal One. Thus is the soul enabled to rise to an immediate vision of the primal unity. Sense cognition is simply a dream of the soul from which it should withdraw and sink itself in its centre, the *Nous;* and as the latter is essentially the universal *Nous* revealing itself in the human soul and absorbed in the contemplation of the primal One, therefore is the human soul likewise through the indwelling *Nous* able to reach this same contemplation of the original unity; and when it arrives at this state all images, thoughts and even self-consciousness disappear and the subject enters the state of ecstasy.

This mysticism more or less modified played its part in later times. Aside from the Persian Sufi, who in the Middle Ages cultivated mysticism within the pale of Islam, there appear among the Christian people of the West tenets that strongly suggest the Indian and Neoplatonic mysticism, for example, with Meister Eckart (q.v.) and the school of German Mystics emanating from him. Eckart is at present defended against the charge of panthesim; nevertheless it is undeniable that his mysticism touches very closely on the boundary line that separates the Christian from the pantheistic world-view. Eckart distinguishes two factors; the «basis» (Fünklein, spark) and the powers of the soul, analogously to his distinction in God between the basis or «ground» and the divine persons. The «ground» of the soul he places in essential union with the «ground» in God. There is something in the soul, he says, that is identified with God, that is one with and not simply united to Him. It is uncreated. This something is the «spirit» the ground or basis of the soul. Here the «ground of God is my ground and my ground is God's ground.» Now this divine spark in the soul he continues, is the organ of mystical contemplation. The «powers» of the soul do not reach God immediately. If man is to see God, the vision must be mediated by a light which is God Himself. And this light shines in the «ground» of the soul. Therefore does the soul see in the «spirit» God's pure essence as it is in itself. The «spirit» or «ground» of the soul penetrates into that «ground» in God, in which the latter is pure simple unity neither Father nor Son nor Holy Ghost. There, in this its «ground,» the spirit seeks God, there to know and love Him without medium or veil. There is «my eye and God's one eye, one vision, one knowing, one love. The eye whereby I see God, is the same eye wherein God sees me. In order, however, to reach this vision of God in His «essence» (ground) man must first of all forsake all sin by genuine repentance. Next he must withdraw from all outward things, from himself and his «powers» and concentrate himself entirely within the essence of his soul; and having reached this state he must «leave» himself to God, hold himself passive and allow God alone to work within him. (Gottlassenheit.) Then will there arise in the essence of his soul (ground) a heavenly light. In this light God reveals to man the entire «ground» of the Deity; the whole essence of God becomes revealed to man. The soul likewise flows into God; its essence and life passes over into the essence and life of God; man is deified, is born a son of God; just as is the Eternal Word.

Subsequently the mystical Theosophists Valentine Weigel and Jacob Böhme built on the teaching of Luther who was in close sympathy with the «German Mystics,» a form of mysticism which in many respects surpassed what most men will call the extravagance of Neoplatonism. A few expressions of Böhme will suffice in this connection. The soul he teaches has its source and origin in the essence of the Godhead; in its «ground» the light of God is enkindled. Now in and by this divine light the soul is enabled to enter into the very heart of the Deity and to see therein without any intermediate the primal generation of God in the three principles of being, and the process of becoming of all things. As I then, he says, earnestly uplifted myself to God, the spirit of God broke through me and my spirit broke through unto the inmost generation of the Deity and in this light did my spirit see all things. The influence of Böhme is seen later in the philosophy of Schilling (q.v.).

Neoplatonic mysticism modified by Protestant doctrine reappears in the 17th century in the mystical speculations and practices of the Cambridge Platonists Cudworth, Henry More and John Smith. Other noteworthy mystical writers in England during the same century were George Herbert, Francis Quarles, Henry Vaughan, and in the following century William Law.

III. Christian Mysticism.— A recent writer has greatly simplified this subject by defining mysticism as «the love of God,» and he quotes in confirmation an author whose genius and amiable personality have endeared him hardly less to those who differ from him in religious belief than to those who venerate him as Saint Francis de Sales. Speculative theology, he says, tends to the knowledge of God. Mystical theology to the love of God,— mental prayer and mystical theology are one and the same thing. They are neither more nor less than the loving intercourse which the soul holds with God. In this sense every Christian whose practice accords with his profession is more or less of a mystic and differs from the highest mystic, the saint, not in his mysticism but in the degree of his mysticism. The term, however, is usually restricted to the higher degree of unitive insight. This simplification of the subject will doubtless be mistrusted, mostly by those who insist on associating all mysticism with mystery and in placing both if not against at least above reason. They should, however, remember that all even human love in a measure transcends reason. Feeling, instinct, sympathy, antipathy, telepathy, likewise, how quickly and far they elude psychological dissection! It may well be then that in the intimate communion of God with the soul which He permeates there are psychical acts and states of which reason and common sense can give no distinct account, «upraising strains that from the memory slip and fall away,» as was the case in Dante's experience. But while mystical phenomena have in common with many ordinary psychical, especially emotional, experiences that they escape rigorous analysis, they lend themselves equally with their familiar analogues to a philosophy and even a certain though higher psychology. This statement will of course be a commonplace to those who are familiar with the great masters of mystical theory, such as Saints Dionysius, the so-called Areopagite, Augustine ('Confessions,' Engl. trans.), Bernard (Engl. trans.), John of the Cross (Engl. trans.), Thomas à Kempis, or the more modern authors mentioned below. For the benefit, however, of those who are not thus informed a very brief summary of the principles of Christian mysticism is here subjoined.

1. As in the macrocosm, the world of living organisms, the law is universal that all life emanates from life, *omne vivum ex vivo,* and as in the scale of their various kingdoms the higher raises up and assimilates the lower the latter receiving an essentially new and greater perfection from the former, so in the microcosm, the minor world of the human individual. Here, too, life is from life and life is from above; and the perfection of the lower consists in assimilation to the higher.

2. Beyond the natural life in man, the soul or mind, Christian Mysticism discerns a supernatural life consisting radically in a principle of activity higher than that of man's purely mental and volitional operations and consequently energizing in higher forms of thought, belief, hope, aspiration, love, etc.

3. The existence and supernatural character of this life and its activities are accepted in the first instance on faith, the data of this belief being found in the Bible, especially the New Testament. The foundations of this faith it is claimed are rational and the workings of the

higher life are confirmed by experience and attested by manifest effects.

4. Essentially and objectively this higher life consists in the vivifying operation of the Divine Spirit within the human soul; accidentally and subjectively it consists in the responsive co-operation of man's mental activities with the Divine influences.

5. The reception of this higher life is normally conditioned by certain spiritual dispositions and lines of conduct — notably of faith, love, prayer, repentance and self-discipline. The soul is thus prepared by alienation from carnal and inordinate propensities and rendered more sensitive to higher stimuli.

6. According to the degree of the soul's co-operation with the indwelling Spirit of God the former becomes proportionately assimilated to the latter. The soul thus passes from what is known as the purgative to the illuminative stage of mystical life.

7. This assimilation culminates in the act of contemplation which is distinguished from meditation in that it is not elicited with mental strain and does not apprehend its object, the divine presence or cognate truths, by inference; but in consequence of the immanent light simply gazes intuitively thereon; *contemplatio pertinet ad simplicem intuitum veritatis,* as all the mystics teach. The clarity of this act or state of vision begets sentiments of admiration, *contemplatio est perspicuæ veritatis jucunda admiratio,* as Saint Augustine says, and fills the consciousness with joy and rapture. The faculties are herein not merely *passive,* for contemplation is a *vital activity,* though the divine influence is the primary source of its elevation and application to the corresponding truths. The Church censured the teaching of the Spanish mystical writer Molinos on the question of the soul's passivity in contemplation,— a theory which was taken up by Madame Guion in France, and eliciting Fenelon's (q.v.) sympathy, entailed the well-known controversy with his great contemporary Bossuet (q.v.).

8. The unitive or contemplative state in so far as it is susceptible of psychologocal analysis is essentially intellectual, the mind being absorbed in intuition; it is, however, no less essentially volitional and in the sanest sense emotional, the whole adhesive power of the soul being drawn out in love of the object contemplated. Obviously, however, the two forms of energy — intellectual and emotional — act and react upon one another and in the intenser states of mental absorption entirely interfuse, all psychical differentiation being obliterated and the entire field of consciousness bathed so to say in light and love of the object contemplated. With the intellectual activity is generally though not always associated representations of the imagination wherein the object contemplated is symbolized. The object-matter of contemplation is primarily God or some of his attributes. Secondarily it may be any divine manifestation in the created, inanimate or animate order, above all in this respect the humanity of Christ. With many of the mystics the suggestion of the divine perfections reflected from almost any object in nature was enough to lift them at once to a condition of wrapt contemplation.

9. The strictly contemplative condition varies in duration from moments to several hours, dependently on preternatural and natural conditions. In the highest stage it may become practically habitual and yet leave a normal residue of attentional energy amply sufficient for all the demands of every-day life. Oftentimes it is associated with extraordinary psychical phenomena such as ecstasy, supernal revelations, visual or auditory — states wherein the mind sometimes though not always loses consciousness of self and of all else save the object contemplated. These are not, however, as many suppose, essential properties of mystical experience, but are rather effects resulting from the absorption of the psychical energy. An asserted similarity of these states to the well-known phenomena transpiring under the various forms of somnambulism, obsession, divided personality and the like, has led many psychologists to confound all mystic states with abnormal psychoses. The subject here opened out is a large one. The reader will find it fairly discussed in 'The Psychology of the Saints.' Suffice it to note with M. Joly that the true mystical state as realized in the saints' experience is not a «disintegration» of the powers of the mind; it is an aggregation of the closest possible kind, which derives its strength from a higher principle under the control of which it forms and sustains itself. It is not a «narrowing of the field of consciousness» but rather the opening out of a wider field, at the cost, if we may use the expression, of a narrowing of the field of passing sensations and empty illusions. Neither is it a «division of the personality» although it certainly evokes what may be called a «new personality,» and that at the cost of great sacrifice and much suffering. This «new personality» is not a medley of divided and disordered parts. It exhibits a cohesion, a strength and a unity above anything else which psychology can show us. This «new personality» also retains whatever was best of the original personality and these surviving elements combine peacefully with the new.

10. None the less the Saints, the typical mystics, were fully alive to the fictitious semblance of purely natural, both normal and abnormal, subjective states to genuine mystical experience and writers on the subject have laid down certain signs for discerning the true from the false. Usually they point to the «fruits of the Spirit» as enumerated by Saint Paul (Gal. 5, 22); «charity, joy, peace, patience, benignity, goodness, longanimity, mildness, faith, modesty, continency, chastity.» The essence of all these fruits of true mysticism is self-denial, love of self-sacrifice and humility; only where such dispositions are habits can the subject be said «to walk by the Spirit.» This mental attitude the mystics observe shows itself in subjection of the will to God and to lawful authority, a care to avoid self-obtrusiveness, a tenderness of conscience, zeal for self-control, deep interior peace even in the midst of misunderstandings and persecutions. On the contrary, they say, where the opposite signs prevail, self-conceit, obstinacy, an appetite for singularity, moroseness, refusal of humiliation, sentimentality in devotional observances, unrest and such like — all being indications of pride, vanity or some form of sensuality — there the subject, though seemingly wrapt up to the third heaven, will be

found to be the victim of an active or a passive delusion.

11. From the foregoing principles it should be inferred that *Christian* differs essentially from purely rational mysticism in the primacy it gives to *divine* influence in mystical experience. The uplifting and sustaining of the intellect and will in communion with God are due not in the first instance to purely innate endowments but to a transcendent light and energy. Christian mysticism as a theory ignores or pretermits none of the ascertained facts and legitimate inferences of psychology and philosophy, but it claims to supplement this knowledge with principles and deductions of a religious and theological character. The higher influences thus postulated though distinct from are nevertheless continuous with the normal psychical life of the mind, just as the higher mental powers are themselves distinct yet not severed from the sentient and organic activities. Thus genuine mysticism by its sharp distinction between the mental activities and the immanent Deity steers clear of pantheism. The terms «deification,» identification with God and the like in which mystical writers speak of the contemplative state are meant to express the close *union* of the soul with God but not a *unity* or substantial identity.

IV. History of Christian Mysticism.— Mysticism as an experience is as old as humanity. The patriarchs Abraham, Isaac, Jacob, Moses, are described in the Bible as men who while not exempt from human failings, lived more or less habitually in converse with God, while the prophets from Samuel to the Baptist passed much of their lives in the abiding realization of the divine presence. The unitive or highest form of mystical life culminates in Christ, who though of necessity perpetually conscious of His Divine Personality nevertheless frequently retired from human association to commune with His Father in the solitude of the mountain or desert. Christ became for all future time the pattern of the mystical life while His Personality, deeds and words have formed ever since the chief subject-matter whereon the genuine mystical mind has been nourished. As his example and teachings spread abroad and the realization of their power deepened in the Christian consciousness the tendency to devote more and more of life to mystical contemplation increased. Spontaneously and gradually at first and accelerated afterward by the pagan persecutions which drove numbers of the early Christians into the deserts the eremitical and subsequently the monastic state grew up and developed, at first in the East and in Egypt and later on throughout western Europe. Monasticism (q.v.) was and is essentially an institution established as a means to facilitate and conserve the contemplative life. Some of the religious orders were founded almost exclusively for this end. Others, and these the majority, aimed at combining the contemplative with the active life, a so-called mixed status wherein the cultivation of an abiding consciousness of the Divine Presence should fructify and energize in labor for human welfare. How successfully this aim was accomplished is told in the history of monasticism and the biographies of such men as the Gregories, Basil, Benedict, Bernard, the Francises, Dominic, Borromeo, Loyola; and of such women as Hildegarde, the Elizabeths, the Catharines, Teresa and other well-known heroes and heroines, of human as well as of divine charity; all of whom drew inspiration and energy for lives of continued self-sacrifice from an almost uninterrupted communion with the Unseen.

Though monastic retirement and discipline facilitate and foster the genesis of mystical habits, they are by no means essential thereto, as is patent from the case of numberless men and women who in every age have successfully united a high degree of contemplation with every variety of secular occupation. Here again the lives of the true mystics, the Saints, show that the cultivation of an abiding converse with God culminating frequently even in deep mystical union is compatible with all the duties and reasonable demands of social life.

V. Mystical Theology.— It is with mysticism as with every other human experience, theory follows on life. Speech precedes grammar, thought logic, conduct Ethics. *Primum est vivere deinde philosophari.* As mystical tendencies and habits spread and strengthened, there gradually grew up a mass of facts and inferences which constituted in time the body of a mystical theory, or what is known as mystical theology, and which took its place in the evolution of Christian doctrine as a sequent of moral theology. Mystical experiences were analyzed and systematized, principles induced therefrom and clarified in the light of Biblical and Patristic teaching, and practical rules for discernment and guidance in the mystical life were formulated; the whole developing by degrees into an organized science or discipline. The writers eminent in the formative stage of mystical theory were Saints Basil, Gregory of Nyssa, Gregory of Nazianza, Chryostom, John Climacus, Cassian, Gregory the Great, Ambrose and Augustine. The first systematic work on the subject was that of Dionysius, the so-called Areopagite. In the intense intellectual ferment that followed the triumph of Christianity the Neoplatonists endeavored to set up against Christianity a world-religion whose controlling tenet it was that the universe is simply a phenomenon of the divine life, the human individual a manifestation of the divine essence, God coming to consciousness in man. Dionysius opposed this teaching, vindicating the Christian doctrine that in the union of the human soul with the Deity it retains its distinct entity. During the Middle Ages the works of Dionysius became for the mystical writers what the 'Sentences' of Peter the Lombard was to the Scholastics, a text for the numerous commentaries of eminent writers such as Hugh and Richard of Saint Victor, William of Paris, Bonaventure, Dionysius the Carthusian, Gerson and others. The Scholastics, likewise, especially Aquinas, based their treatment of mystical phenomena on the Areopagite. The influence of Neoplatonism (q.v.) lingered, however, in the writings of Erigena, even though he translated the works of Dionysius.

A tinge of Neoplatonism moreover clings to the 14th and 15th century writers, Tauler, Suso and Ruysbroek, who theorized more in the interests of an intellectual union with God, while the most eminent teacher of practical mysticism — union of will — was at this time Thomas of Kempen. In the subsequent centuries practical mysticism is systematically represented by Saints Teresa, John of the Cross, Francis de Sales and Ignatius of Loyola. The works of these writers have for the most part been translated into English. Among the later mystical authorities may be mentioned Louis of Blois, John of Avila, Louis of Granada, Louis da Ponte, James Alvarez, Alphonsus Rodriguez, Nieremberg, Lancicius, Surin, Godinez, Scaramelli, Benedict XIV and Schram.

Bibliography.— Joly, ‹Psychologie des Saints› (English trans.) (1898); Tyrrell, ‹Faith of the Millions› (1901); Ullathorne, ‹The Endowments of Man› (1880); Devine, ‹A Manual of Mystical Theology› (1903); Inge, W. R., ‹Christian Mysticism› (1899); id., ‹Studies of English Mystics› (New York 1906); id., ‹Personal Idealism and Mysticism (ib. 1907); Recejac, ‹Bases of the Mystic Knowledge› (1899); James, ‹Varieties of Religious Experience› (1902); Royce, ‹The World and the Individual› (1902); Görres, ‹Die Christliche Mystik› (1836–42); Ribot, ‹La Mystique Divine› (1904); Migne, ‹Dictionnaire de Mystique Chretienne› (1858); Von Hugel, Friedrich, ‹The Mystical Element in Religion› (2 vols., New York 1909); Wetzer Welte und, ‹Kirchen-Lexicon› (1893).

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MYSTROPETALON, a genus of leafless root-parasites constituting the tribe *Mystropetaleæ* of the order *Belanophoreæ*. It contains two South African species. It is known by the two or three free stamens, cubical pollen-grains, and the two-lipped staminate and bell-shaped pistillate flowers. The stem is sheathing covered by imbricated scales; the flowers in dense heads or spikes. They are monœcious, the male flower being on the upper and the female on the lower part of the spike. The fruit is a rounded achene.

MYTENS, mī'tĕnz, **Daniel**, Dutch painter: b. The Hague, about 1590; d. Holland, 1642. He went to London, England, and was welcomed at the court of James I; he was appointed painter royal by Charles I and was much favored by the king and aristocracy. Many of his portraits, which are bold and spirited in conception, broad in treatment and of admirable color, are in Hampton Court. When Van Dyck came to England he gradually eclipsed in royal favor the glory of his predecessor, who returned to Holland.

MYTH, a general name for certain kinds of folk-lore stories, historic tales setting forth the processes of nature, or beliefs about religion, custom, tradition, etc., and differing from fable (q.v.) and from legend (q.v.). See Mythology.

MYTHICAL ISLANDS, imaginary islands described in popular fable, romance and song, supposed to have existed in all ages in the several oceans of the world. The Islands of the Blessed were creations of the Greeks, who there placed the homes of all who had been first mentioned by Plato, and situated in the realm of eternal bliss. The lost Atlantis was first mentioned by Plato, and situated in the same part of the world. The fairy isle of Avalon is a feature of Celtic mythology, presenting an exact counterpart to the Greek Island of the Blessed. The mythical land of Saint Brendan is also of Celtic origin and was thought to lie off the west coast of Africa, where, even as late as the 18th century, frequent expeditions searched for it. The Island of Seven Cities was also long sought for, and its settlement is ascribed in legends to the Christian refugees from the Iberian Peninsula, who had been driven out by the Mohammedans. Marco Polo's ‹Cipango› was probably Japan. Probably the best known mythical lands or islands during the Age of Discovery were the island of Bimini, in the Bahamas, and the island of Brazil.

MYTHO, MITHO, or **MITO**, French Indo-China, a town of Cochin-China, on the northernmost branch of the Mekong delta, about 50 miles by rail southwest of Saigon. Mytho is an important trading centre for the produce of Cambodia and Annam, and the railway from Saigon was the first built in the country. It has a college and a hospital. Pop. 30,000.

MYTHOLOGY. (Latin *mythologia;* Greek *μυθος*, a myth, and *λογία*, an account), includes the whole body of myths of a nation; the explanation, comparative study and interpretation of these myths. In the popular acceptation of the term, mythology, however, is used to signify the religious conceptions of races expressed in the form of tales and other accounts of their deities. This is a very restricted part of the broad field of mythological activity; for mythology covers the whole sphere of activity of races before the knowledge of the laws of nature came to replace the exercise of the imagination in the explanation of natural phenomena. It includes physical, historical, philosophical and religious myths, generally so intermingled and interdependent that it is often difficult or impossible to separate the one from the others, since the imagination was the great source from which they all sprang either as a whole or in part. Owing to this constant play of the imagination, such history as primitive races possessed rapidly became myth, and the myths assumed the form, appearance and intent of history. During the pre-scientific ages, the greatest of all virtues was credulity in the scientific, philosophical and religious beliefs of the mass of one's fellows. Thus creed became a synonym for religion, or the true religion. To-day the Pueblo Indian speaks of one who holds to the faith of his ancestors, as «the true believer.»

How Primitive Man Thought.— Man has apparently, since ever he began to reason, tried to explain the natural phenomena which most impressed him; and his success has always been in proportion to his scientific knowledge. At the beginning of his investigation of the phenomena of nature he was handicapped by an absolute ignorance of all natural law, and he was forced to reason from his experiences, much as the higher forms of animals do to-day. To him all life meant activity of some kind, generally translated into motion, and conversely, all activity meant life and volition. Thus when the sun, the moon and the other planets appeared and disappeared or changed form or position in the sky or appearance, they did so by their own volition. Behind the rushing of the wind, the fierce heat of the sun, the blighting cold of the north, the thunder of the clouds, the destructive fury of the hail and the lightning, the insatiable greed of the fire, the reviving force of water and of the midnight mists and summer showers were so many powerful intelligences, human in every respect except in their magic power, working each his sovereign will. So primitive man peopled the physical world about him with a multitude of beings essentially like himself in their ambitions, desires, motives, loves and passions. These he classified unconsciously according to their apparent swiftness, strength, cunning and constancy, the primitive virtues by which he set great store, and the impenetrable mystery by which they were surrounded. These were the supernatural people in contradistinction to the human race, which belonged to the natural people. But it is necessary to understand in what sense the word supernatural is here used. It never implies beings in any sense different from man himself except in the power of their magic. Even the form in which a supernatural being appeared was not of great moment, since he generally had the power to exchange his shape for another at will. The Sun-father, the Moon-mother, the Thunder-man, Morning-star, the great hunter, the Spirit of the Northland, the Summer-queen, the four great Wind Spirits, the ghostly spirits that rode upon the tempests, the dark beings from the under-world, the bright beings who peopled the Cloud-land, the Sky-land and the Sun-land were essentially human; and each lived in strict conformity with his surroundings and attributes. The Sun-father and the Moon-mother inhabited a shining wigwam in the Sky-land, the Frost-spirit a yellow ice tepee in the far North, on the outer border of the world. The Great Spirit sat far up upon the mountain and smoked his pipe; the four winds blustered and quarreled and had ambitions and loves, hatreds and jealousies essentially human. The waters moved, rippled and roared; the trees swayed and whispered; the leaves rustled; the clouds raced across the sky or lazily disported themselves in the sun. All displayed animation which made them fellow-actors with man on the stage of human activity. Into this curious world so unlike our own scientific age, the study of mythology introduces us. Here all nature is not only alive but instinct with the motives that move humanity to action; and no explanation or interpretation of mythology which fails to keep constantly in mind primitive man's ignorance of the laws of natural phenomena, and its effects upon his religious, scientific and philosophical views can be effective.

The Spirit of the Myth.— To understand the spirit of the myth one must learn to live over again the age which produced it. Without this, the practice of minute analysis of myth forms and derivation of myth names, the division of mythical stories into historical, scientific, religious and folk-tales and the minute grubbing of the ordinary scientific methods are of little avail. The study of mythology, like that of history, requires the power of imagination coupled with the patience and the trained methods of the scientific mind. However well the division of myths into classes may serve the uses of scientific study, the farther investigation is carried into the past the more all classes of mythological stories come into contact, mingle or blend with one another and reveal to us man trying to solve the primitive problems presented to the race. He develops these problems as he sees them and he explains them in conformity with his mode of science. In the very infancy of experimentally acquired knowledge he began to record his racial or tribal experiences in the form of stories, songs, symbols, dances and fixed ceremonies coupled with mystical formulæ and incantations. However unreasoning these may seem to the scientifically trained mind of to-day, they were nevertheless perfectly reasonable to primitive man who propounded them. The primitive myth-maker, which is but another name for the primitive philosopher and scientist, noticed that the sun moves away from the equator in the winter and that then the days are shorter and the nights longer, and he invented a legend or tale to account for it. This tale conformed in every respect to the belief of himself and the people of his day. The sun was a great and powerful being. The night spirit grew jealous of him and came and persuaded the people that the sun was an impostor, that he was not at all powerful since he allowed himself to be driven daily across the sky in the self-same track. So the people mocked the sun and taunted him with his impotence, whereupon he became angry and vowed to leave them in darkness. As he moved farther and farther to the north and the days became shorter and colder and the frost spirits seized upon all the land and froze over the lakes and rivers, the people became terrified and made sacrifices and offered dances and music to the Great Spirit, who finally relented and came back to them. But to remind them of the fact that he is all powerful and to make sure they shall never forget the insult they offered him, the sun goes north for a part of each year and shortens the days and lengthens the nights. In this myth the sun is essentially human and he acts as an all-powerful kindly human being would do, especially in a primitive age, were he insulted. To the primitive mind the scientific fact around which the story is woven was satisfactorily explained by the story itself. The existence of summer and winter is accounted for by a similar nature myth and though the two myths explain what is practically the same phase of nature, yet to primitive man there was no inconsistency in the stories simply because to him the gradual retreat of the sun northward and the coming of winter were two distinct events in no way connected with each other. Nor for him was the coming of summer dependent on the going away of winter, though the events happened to be coincidental, for both summer and winter were powerful beings each of which acted of his own volition. An Algonquin myth brings them together through the Great Spirit who went northward, with the spirit of summer in his hunting-jacket, and routed the spirit of winter out of his ice tepee and brought the summer to the northland.

Man and Nature.— To primitive man all nature was a struggle, not of elements, but of wondrously powerful and intelligent beings who were so real to him that they may be said to have formed as active and concrete a part of his existence as his household, his friends and his enemies. About these beings of his imagination he built up a mass of traditionary lore which was carefully handed down from father to son. In this lore he grouped and classified these supernatural beings; and to each he attached myths to explain their attributes, powers, functions and affections. Quite philosophical were these myths from the point of view of their creators. The earth received the seed and the sky sent the water that made it grow. The union of the two gave birth to the plant. Thus the earth and the sky became wife and husband. The sun was the greater light that ruled the day, the moon the lesser light that ruled the night, so in many theologies the former was the husband and the latter the wife, while the morning star, which appears with the sun, was their offspring. However, frequently in northern mythologies, where the light of the sun loses its great power for a part of the year, the latter frequently becomes the wife and the moon the husband. The moon governed the night, the season when the mists most frequently descend upon the land. So she becomes the goddess of fertility and as such is closely connected with all the water and vegetation deities. In Egypt Egyptian women prayed to Isis, the moon goddess, that she might look kindly upon them and bless them and make them fruitful. Roman women about to be married invoked Juno, the queen of heaven, that she might make them bear children; and Greek women made the same prayer to Hera, the mother of the stars, the queen of heaven, the moon goddess, the great deity of growth and fertility. Among the Aztecs and other cultured races of America, Indian women prayed the moon to make them fruitful; and offerings are still presented to the moon throughout Indian America with the same end in view. So strong is this belief that the Indian of Latin America frequently associates the name of the ancient moon goddess with that of the Virgin; and so powerful has the influence of the Indian become that not only Indian but also educated white women go to certain shrines of the Virgin to pray that they may be blessed with children. Indian women still hold up their new-born children to the moon-mother that she may bless them and make them, in their turn, fruitful. Being the patroness of growth, birth and fertility the moon became the deity of doctors and of medicine, and among Egyptians, Indo-Europeans, Aztecs, Mayas, Zapotecas and Mixtecas alike she took a kindly interest in people of feeble mind or those afflicted with skin or other scrofulous diseases. She was also the protectoress of young children and animals both in Europe and America. She was the goddess of hunters and is frequently represented as armed for the chase. A close examination of all these functions and attributes of the moon goddess will show that they are closely related, interdependent and that the one naturally grew out of the others. The moon, in most of the Indian mythologies of America, was also the mother or the grandmother of the winds or some of them, who are themselves the bringers of the fruitful rains and mists. Here again the mythology is consistent.

Growth of Myths.— Examples might be given ad infinitum, but the foregoing are sufficient to show that the mythologies of most ancient races represented systems of thought, of philosophy and religion which followed what were then rational lines of reasoning to those holding them and passing them on to succeeding generations. These ancient myths were at once religious, philosophical and scientific in that they contained within themselves the religious, philosophical and scientific knowledge of the race or what passed for such. Behind all mythologies are broad, general principles which lead, everywhere, to similar results. This accounts for the similarity of apparently unrelated myths in widely different parts of the earth, a similarity more marked in the nature myths. The comparative study of myths is of as much importance in the development of the science of mythology as is the comparative study of languages in the development of the science of philology; since the general laws that govern the making of myths seem to produce as closely related results as those that govern the formation of languages. Fairy tales, folk-tales, historical, philosophical, religious and scientific myths are continually running into one another. Often one short tale contains all these elements. Hence the field of study is not only very extensive, but the lines of thought are continually crossing and recrossing one another. Out of this confusing maze have come many theories, explanations and systems of mythology, most of them defective in that they have failed to survey the whole field and to take into account its broad general significance. Mythologies are like rolling stones, they take new forms as they move onward; and when they come to rest they gather extraneous mosses, which disfigure them often to such an extent as to hide their original forms. These changes are due to both external and internal influences, to action and reaction. Dissimilar myths are often found side by side apparently unaffected by one another; others are blended, while still others are so confused from long contact with one another that their original functions and attributes are not clearly discernible. Tribal influences, captives, slaves, foreign teachers and philosophers, servants, broken-down mythologies and the myths of subject people all have had their part in the shaping of the myths of nations. The constant rising and dying of religious, scientific and philosophical ideas, throughout the long unwritten history of man's progress toward civilization molded and shaped his myths; so that it is safe to say that however primitive myths may seem to us, there are probably no primitive myths in existence, since, man even in his lowest stage of development to-day, has passed far beyond the condition of his ancestors when they first began to formulate their philosophy of the world about them in the stories that we have named mythology. In the days when the Romans had conquered the civilized nations surrounding them, Rome had already become the meeting-place of creeds or mythologies as had Athens in the days of Paul. And often there, the same deity was worshiped in separate temples and under separate guise. There were temples to Juno and Luna, both moon deities, to Hera the Greek goddess of the moon and Isis the Egyptian moon divinity. Each was the sovereign lady of the sky. And when Christianity stepped in and drove out the heathen deities, her triumph was only partial, for the converted heathen could not so easily forget his past. To his new Christian saints he attributed the powers and virtues of his ancient gods. Upon the Virgin, as the lady of heaven, he lavished all the adoration given to the moon divinities, and he long loved to depict her as standing upon the crescent (the symbol of the moon). Thus the mythologies of the past have followed us into the present. In art, achitecture, literature, philosophy, science, their names and influence greet us at every turn; for the dead past has not buried its dead. To-day the Christianized Indian throughout Latin America, in his Christian devotions, thinks as frequently in terms of his ancient gods as of his new faith. To the Virgin he attributes the power to send the rain, to fertilize the earth, man and beast; and he still puts food on the graves of the departed that they may have provision for their journey to the future world. Once a year, on the «dia de los muertos» (day of the dead), when the dead are popularly believed to revisit the earth, he decorates their resting-places in like manner. Thus the present teaches that the mythologies of the past were constantly being modified and changed while they were exerting their influence upon dying or supposedly defunct mythological systems. This is the same principle that was at work when Greece, Rome, Egypt, Assyria, Arabia, Persia, India and the broken-down mythologies of the races who preceded them, acted and reacted upon one another. To these must be added the modifying influences of the Celt and the Arab, the German and the Mongol, who each, in his own way, left his mark upon the mythologies of northern Africa and southern Europe and Asia.

Classes of Myths.— Myths fall into several more or less well-defined classes: myths of origin, myths of the stars and the sky-land, folk-tales, myths of the future world and of ancestors, and myths relating to or explaining the elements. Origin myths account for the creation of the universe, of man, the other animals and plants; for the customs and habits of animals, trees and plants and for their peculiar markings and characteristics; for the origin of tribes and races and for their racial names, tokens and customs. Under this head come the culture gods, the inventors and bestowers upon humanity of the arts, trades and sciences, of which they naturally became the patron divinities. The myths of the sky-land and the stars, as the name indicates, deal with the solar, stellar and lunar stories and their relationship to one another and to the other dwellers in the sky-land. They are, in many mythologies, closely related with the creation and the culture myths. The moon-mother as the fructifier and the goddess of medicine is in the category of the culture heroes, of whom she is generally the mother or grandmother or near ancestor. The sun, as the vivifier, the sender of life and death, has a close relationship with the deities of vegetation. The myths of the future world deal with the mystery of death and connect the earth with the sky, the sun-land and the under-world. They include tales of the life beyond the grave, of visits of mortals to the land of the dead and of their adventures in the future world. Very varied are these myths among different peoples; and yet they are frequently wonderfully similar in widely separated localities. They range from simple primitive tales to long heroic, circumstantially told stories in which the hero generally meets with many superhuman difficulties on his visit to the land of the dead. Closely connected with these tales are the ancestor myths, which form such an important part of the mythologies of many races. Myths relating to or explaining the elements are many and varied. The deified winds become the culture gods; the thunder, the great thunder-bird. The woods, clouds, mountains and streams are populated with spirits belonging to the elements who, for the most part, are kindly disposed toward man and spend their time in helping him, when so inclined. In the Indo-European mythologies the sky was populated with a great host of supernatural and powerful beings and the mythologies of the more cultured of the American races were almost as liberal in their colonization of the ærial regions.

To these classes of myths already enumerated must be added the vast body of folk-tales which may be related to none of them, some of them, or all of them. Many races have numerous folk-tales, part of which may have once belonged to a now displaced and broken-down mythology. Side by side with these are often found moral tales which appear never to have had mythological signification or connection. These tales are quite plentiful among many of the American races, and those possessed by the Pueblo Indians are especially numerous and rich in incident. Tales of adventure linked to magic and consisting of a series of superhuman acts find a place among the Algonquin, the Ojibway, the Plains Indians and numerous of the Pacific tribes. These tales approach more closely to the European story than probably any other class of American tales. The characters in these stories are generally mythological in origin, however much they may seem to have lost their primal signification. Thus in the Indian story of Chácopee the Giant Killer, the hero who lives all alone in the heart of a great forest with his grandfather, follows a white rabbit who shows him a village of cannibal giants and tells him he has been born into the world to destroy them. He gives Chácopee a magic white feather for plume, a bag, a magic cord and a magic pipe. When Chácopee smokes the pipe out of it come the souls of the dead slain by the giants, who are frightened by them. With the aid of the cord he trips up the giants one after another, kills them and wins a race he runs with each of them except the grandfather-giant whom he is enabled, with the aid of the rabbit's charms, to defeat, after numerous adventures, all of a miraculous character. In most civilized or semi-civilized races the folk-tales are likely to be the largest body of popular stories in the language because they have been fashioned not only from long ages of folk-tales, but from the broken down myths and creeds of their ancestors and the races who preceded them. Folk-tales are especially plentiful among the Mongolian and Indo-European races. To this class of story belong the imaginative Celtic fairy tales. Folk-tales of a more primitive class are very plentiful throughout Africa and Polynesia; and many of a higher and more interesting type exist among the American Indians, some of which bear a curious resemblance to the folk-tales of nothern Europe and northwestern Asia.

Transformation.— The pre-scientific world firmly believed in transformations. This was the natural outcome of the personification of all nature. The wind was a person, vet he became invisible; the sun, also a person, hid himself, as did the moon and the morning star, behind a mask. The spirits of the forest whispered or roared or chatted, but they could not be seen by human eyes, either because they were hidden within the trees or because they had actually changed themselves into trees. The rivers, the mountains, the clouds were persons; but because of this power of self-transformation they could not be seen by earth-beings. If spirits could hide in trees and other moving things they could just as easily hide in sticks and stones. So inanimate objects, the residence of such spirits, became fetiches and wonder-working charms. Thus all nature, animate and inanimate, to the ancient myth was the abode of life, active, free and powerful as human life itself. All these different possessors of life might, on occasions, have the power of self-transformation. The simple fact of their appearing in some other than the natural human form was sufficient proof of their power of self-transformation. There were also, according to the belief of the mythological ages, other powerful beings who, in addition to possessing the ability to transform themselves, could bestow upon another the power of transforming himself. This was generally accomplished through the presentation of some wonder-working fetich which enabled the owners to effect self-transformation. Thus the hunter, in the Algonquin tale of the ‹Wolf-Man,› takes from the breast of the wolf-man himself a powerful amulet, which enables him to transform himself into any form he desires. Though the wolf-man pursues him and overtakes him at sun-down each day for six days in succession, he outwits him each time by his transformations and succeeds finally in drowning him by the same means on the seventh. In the tales of ‹The Witch and the Wind-Man› the Mole-man shoots his magic arrow into the cloud on which his brother, the wind-man, is riding and drives it backward with terrific force. This he does several times until finally he wins the race against him. In the same tale the Old Witch changes herself into a monster white rabbit and thus lures the nine brothers to her den; but the wind-man rides the wind into the cave of the supernatural people and rescues the brothers before the witch has had time to get them fattened enough to eat. Many similar Indian tales are built about the supernatural power of self-transformation. Nanabozho, the great culture hero of the Algonquian races, under his many tribal names, is an adept at transformation; and in nearly all his adventures in which he takes the leading part he makes use of it. The heroes of the Plains Indians are constantly subjecting themselves to self-transformation. Everywhere throughout Indian America the belief in transformation is strongly exemplified in the mythology and folk-tales. Witches, wizards and other evil-disposed beings had the power of self-transformation, and unnumbered are the myths, legends and folk-tales in which they figure. In the rivers and the lakes and pools were other evil-disposed spirits who delighted in luring people to death. These characters are well known in Latin and Greek mythology; but just as picturesque tales are told of them in the stories of other races. Under the name of the Malinche, the water siren shows herself as a beautiful woman on the tops of certain mountains in Latin America and lures men to her only to tear them in pieces. As the Llorona or «Crying one» she inhabits pools, lakes and rivers where she cries like a lost child in the night and draws her victim on to his death; for when he falls into the water she drags him down; so that there is no chance of escape for him. Or she may change herself into a «fool's-light» and lead some unfortunate into a bottomless swamp where death is equally certain. In all these stories self-transformation is the chief motive.

Ritual, supplying as it does the means whereby the correct relation to the various superhuman powers may be properly maintained, forms a very considerable part of mythology. Since the beings to be worshiped or propitiated are varied in attributes and powers the ritual and ceremonies dedicated to them must be varied also. In an age when the virtues of magic, charm, song, incantation, ceremonial dancing and instrumental music were firmly believed to be effective means of protection against adverse powers or of attracting the favorable attention of divine beings, extraordinary importance was placed upon the literal rendering of ritual and all other ceremonial forms. This belief helped to preserve ritual myths in a substantially unchanged form for generations; and many partially broken down myths repeated by primitive and other races are the survivals of the stories that once formed part of or went with rituals to explain them or to account for them.

See GREEK MYTHOLOGY; ROMAN RELIGION; AMERICAN MYTHOLOGY; MEXICO — MYTHOLOGY; PERSIAN MYTHOLOGY; MYTHS AND FOLK-TALES; NURSERY LORE; EGYPTIAN RELIGION AND SOCIOLOGY; FOLK-TALES AND MYTHS OF THE AMERICAN INDIANS; NATURE WORSHIP.

Bibliography.—Anderson, R. B., ‹Norse Mythology› (Chicago 1889); Bancroft, H. H., ‹Native Races› (New York 1875); Brinton, D. G., ‹Religion of Primitive Peoples› (New York 1897); Cox, G. W., ‹Mythology of the Aryan Nations› (New York 1903); Cornyn, J. H., ‹El Modo de Pensar del Hombre Primitivo› (Mexico City 1913); ‹Around the Wigwam Fire› (New York 1919); Dowson, J., ‹A Classical Dictionary of Hindu Mythology› (London 1878); Ehrenreich, P., ‹Die Allegemeine Mitologie› (Leipzig 1910); Fisk, John, ‹Myths and Myth-Makers› (New York 1900); Frazer, J. G., ‹The Golden Bough› (New York 1907–13); Gray, L. J., ‹The Mythology of all Races› (New York 1916); Grimm, J., ‹Deutsche Mytologie› (Berlin 1878; London 1888); Harrison, J. E., ‹Prolegomena to the Study of Greek Religion› (Cambridge 1908); Hartland, E. S., ‹Legend of Perseus› (London 1896); Hopkins, E. W., ‹Religions of India› (Boston 1895); Howett, A. W., ‹Native Tribes of Southeast Australia› (London 1904); Jastrow, M., ‹Religion of Babylonia and Assyria› (Boston 1898); Keary, C. F., ‹The Dawn of History› (New York 1902); Lang, Andrew, ‹Myth, Ritual and Religion› (London 1867);

‹Custom and Myth› (London 1884); ‹The Making of Religion› (1898); Maunhardt, W., ‹Antike Wald und Feld-Kulte› (Berlin 1887); Müller, Max, ‹Lectures on the Sciences of Languages› (London 1871); ‹Contributions to the Science of Mythology› (London 1897); Renouf, P. L., ‹Religion of Ancient Egypt› (London 1880); Röscher, W., ‹Lexikon der Griechische Mytologie und Religion› (Munich 1906); Rydberg, V., ‹Teutonic Mythology› (London 1889); Spencer, H., ‹Principles of Psychology› (New York 1900); Squire, C., ‹Mythology of the British Isles› (London 1907); Tylor, E. B., ‹Primitive Culture› (London 1873); Van Gennep, ‹La Formation des Legendes› (Paris 1910); Wundt, W., ‹Mythus und Religion› (Leipzig 1908).

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MYTHOLOGY, American. See American Mythology.

MYTHS. See Mythology.

MYTILENE. See Mitylene.

MYXEDEMA, a peculiar state of the nerve tissues of the body causing many nutritive changes in the body. Its cause is a loss of function of the thyroid gland (q.v.) and a resulting diminution in the supply of its secretion to the blood. It is strictly a fibrosis of the thyroid. The disease was first described by Sir William Gull of London in 1873. A similar condition results from removal of the gland by operation. Women are the principal sufferers, furnishing 80 per cent of the cases. Myxedema is found in cold climates, and probably most frequently in Europe; in certain districts for instance in Switzerland, France and Italy, it appears to be endemic. It is believed that certain mineral constituents in the water in these regions is the cause of the endemic cretinoid degeneration, as the water was brought from a distance to a certain goitrous region in Rupperwill and the disease disappeared. The onset of the disease is gradual, and the symptoms are loss of activitv, sensitiveness to cold, falling of the hair, decay of teeth and nails, rough, dry skin, spongy gums, diminution of perspiration, yellow tint and swelling of the face, paleness of the mucous membrane, subnormal temperature, constipation, albuminuria, impairment of sight and hearing, headache, slow intellection, hallucinations and, in some cases, a hypothyroid psychosis. A most striking symptom is the œdema, which develops principally in the loose subcutaneous tissues, appearing like a considerable swelling. The face, the back of the hands and the upper limbs first present enlargement; but in time it involves the whole body. The thickening and enlargement of the face renders the patient unrecognizable.

What has been called infantile myxedema by some writers is characterized by a failure of the child to develop bone in the normal manner, the result being a fat dwarfish individual. The dentition is imperfect and the anterior fontanelle does not close for many years.

Treatment consists in the administration of thyroid gland and of tonics. Grafting of a partial or entire thyroid gland taken from an animal into the subcutaneous tissue has not been very successful. Internally a glycerine extract of sheep's thyroid is given, or a dry extract, or an emulsion may be made and used hypodermically. This treatment was first suggested by Murray, of Newcastle-upon-Tyne, in 1891. The remedy must be used cautiously, especially if cardiac or vascular disease exists. Thyroid may cause vomiting, diarrhœa, fever, profuse perspiration, headache, glandular swellings and prostration. The dose should be graduated so as to avoid these symptoms of poisoning. After many months of treatment the disease disappears. The dose should then be diminished, but the patient must continue to take thyroid all her life, lest the myxedema return. (See Cretinism; Thyroid Gland). Consult Gull, ‹On a Cretinoid State Supervening in Adult Life in Women› (in Clinical Society's ‹Transactions,› London 1874); Gimlette, ‹Myxœdema and the Thyroid Glands› (London 1895); Jelliffe and White, ‹Diseases of the Nervous System› (3d ed., 1919, ‹Endocimopathies›).

MYXOSPORIDIA, or fish psorosperms, are Protozoa belonging to the class Sporozoa. They are characteristic fish parasites, occurring on the gills, in the skin and muscles, and free in swimming bladder, gall bladder and urinary bladder. Serious epidemics and common diseases among fishes are due to their excessive multiplication under favorable circumstances. The spores which are produced in large numbers in the protoplasm of their bodies contain 1, 2 or 4 polar capsules with a coiled thread like the nematocysts of the hydra.

N

N the 14th letter of the English and several other alphabets is classed as a dental-nasal consonant; it is pronounced when a voiced sound is emitted through the nose while the tip of the tongue is in contact either with the front upper teeth or with the front of the palate; the position of the tongue, whether touching the teeth or the palate, distinguishes the *n* of one language from that of another; the *n* of English speech is produced by placing the point of the tongue against the palate just behind the gums. When *n* is followed by a gutteral either the *n* and the gutteral form one nasal sound, as in ring, or the *n* becomes distinctly gutteral and the gutteral retains its own sound-value, as in rink; but when the *n* and the gutteral belong to different syllables, as in the words engage, include, concave, unkind, the *n* usually retains its pure sound; yet the rule has many exceptions recognized by orthoepists, who while they regard the *n* of syncarpy, syncretist, as pure, mark the *n* of syncope and many other words as nasal, equal to *ng*. In words ending with *n* preceded immediately by *l* or *m*, the *n* is silent: kiln, hymn; in the beginning of a word a consonant preceding *n* is silent: know, gneiss, mnemonic, pneumatic. In many words is seen an intrusive *n*, as in passenger, messenger, though the words from which these are formed, passage, message, have no *n*. The initial *n* of newt, nickname, and a few other words is the *n* of the indefinite article which became inseparably attached to ewt, ekename, etc.; conversely, by dropping the initial *n* in the forms nadder, nauger, napron became adder, auger, apron. The alphabetical character *n* has remained almost unaltered in shape from Phœnician to English. See Alphabet; Phonetics.

N-RAYS, a supposed form of new radiation discovered by M. Blondlot, while experimenting upon the polarization of the X-rays. The rays were said to be invisible, but could be deflected, and by means of appropriate screens could be seen, and were marked out in great detail by Blondlot and his followers. These rays were declared to be susceptible to the attraction of gravitation; and were decided to lie in wave-length between the shortest electromagnetic rays and the longest of Rubens rays. Many interesting discoveries were supposed to be made concerning the N-rays; they were detected as issuing from various objects in a state of tension or torsion, such as a cane forcibly bent; a stick of crystallized sulphur; compressed rubber; ice at zero; or a piece of tempered steel: the rays disappeared when the temper was drawn. An eminent French physiologist asserted that he had seen these rays issuing from muscles, when active, and from nerves after death. One curious thing about the supposed rays was that, while some of the observers could see them clearly, others were quite unable to see them, nor could their instruments detect their operation. Blondlot and his disciples asserted that this was due to the fact that those who were unable to see the rays possessed defective vision, and that, while the rays really existed, only those peculiarly endowed could perceive them. Two other forms of these rays were announced, the N_1-rays and the N_2-rays. These rays were believed in for several months by an increasing number of eminent scientists, though doubt as to their existence had begun to be aroused, when experimenter after experimenter failed to detect them. Finally, after a prolonged series of experiments the conclusion was reached that these rays were subjective in character and had no real existence. A summary of the very voluminous literature published on the subject may be found in the *Journal of the Franklin Institute* (Vol. CLXIV, Philadelphia 1907).

NABAL, in Biblical history (1 Samuel xxv), the name of an Israelite of the tribe of Judah. David, having afforded protection to Nabal and saved his flocks and herds, his property and even his life when in danger, some time after sent to him to supply his troops with provisions. This Nabal refused; on which David, stung with the ingratitude of the man, vowed to take summary justice on the ungrateful Jew and exterminate his family; and taking with him 400 men set out for the residence of the mercenary Hebrew. Abigail, Nabal's wife, hearing of her husband's conduct and David's resolve, collected such provisions as the army required, and, attended by a train of servants, set out to meet the approaching king. Her beautiful person, combined with the excuses she made for her husband's conduct, so softened the heart of David that he accepted her gifts, averted his wrath, and Nabal having been «smitten by the Lord» a few days after, David married his widow.

NABATÆANS, a Semitic race of people whose kingdom extended from Damascus on the north to Al-Hajr (Hegra) on the south. They were in possession of the country as early as 312 B.C. for Antigonus and afterward his son Demetrius tried in vain to conquer them. Judas and Jonathan had relations with them at the time of the Maccabean struggles (1 Macc. v, 25; ix, 35). The Edomites were forced up into southern Judah by them. They are chiefly known by inscriptions, written in Aramaic, which seems to establish the fact that they were either of Aramaic origin directly, or of Arabaic extraction later influenced by the Aramaic. These inscriptions give information concerning the rulers, but since they are mostly funerary, they furnish no other historical data. Their commerce was very important, as their capital Petra (q.v.) was on the route from Egypt to central Arabia. A temple to their native deity was found at Puteoli, an Italian port — which indicates the presence of a Nabatæan colony there and points to the extent of their vast trade. A coinage of the country dating from the 2d century B.C. bears the names of the rulers. These, with their approximate dates, are Malchus I (145 B.C.); Obodas I (97–85 B.C.); Aretas III (85–62 B.C.); Obodas II; Aretas IV (2–50 A.D.); Malchus II (50–70 A.D.); Rabel (70–95 A.D.). There are also coins of Alexander Jannæus, Hasmonean king of Judea, who captured some of the trans-Jordanic cities and struck coins in them. The Nabatæans were very powerful in the 1st century B.C., but lost Hauran and Peræa to Herod, retaining fortresses on the edge of the desert. Under Augustus the country became a Roman dependency and lost its warlike nomadic character. Some later inscriptions have been found which are in Arabic, but the word Nabatæan is generally used as synonymous with Aramæan. (For their alphabet see plate under Alphabet). Their national temple was at Al-Hijr, and the chief gods seem to have been Dusares, Manat, Kais, Allat and Hobal. Consult Cooke, G. A., ‘North Semitic Inscriptions’ (pp. 214–262, 1903); Head, ‘Historia Nummorum’ (pp. 685–686, 1887); Vincent, F. H., ‘Les Nabatéens’ (in *Revue Biblique*, pp. 567–588, 1898); Mommsen, ‘Provinces of the Roman Empire’ (pp. 160–171, 1887); Schürer, ‘History of the Jewish People’ (Vol. I, Eng. trans., New York 1896).

NABOB, or NABAB, the title applied to the administrator of a province ruled by the viceroy. The name was also given to unofficial wealthy natives as a term of derision.

NABOB, The, a novel by Alphonse Daudet, published in 1877. This is one of the most highly finished of the author's works. It is a romance of manners and observation.

NABONASSAR, năb-ō-năs'ạr, **Era of.** See Babylonia; Nebuchadnezzar.

NABONIDUS, nab-ō-nī'dŭs, or **NABONADIUS** (Babyl. *Nebûna'id*), last king of Babylon (555–538 B.C.). He was elevated to the throne by his fellow-conspirators in the murder of Prince Labossoracus (or Laborosoachard). Soon after his accession he concluded with Lydia and Egypt an offensive and defensive alliance against the Persians under Cyrus. He then greatly strengthened the defenses of his capital. It was not, however, until 539 B.C. that Cyrus, who had already defeated the impetuous Crœsus, marched upon Babylon. Nabonidus followed the traditional Oriental strategy in opposing his foe. He fought a battle within sight of Babylon, was utterly defeated, and then, while most of his army found safety within the great walls, he himself with a small force entered Borsippa, an important town southwest of Babylon; possibly hoping by this movement to force Cyrus to divide the Persian host. His stepson, Belshazzar (Bil-shar-uzur), familiar through the scriptural narrative in Daniel, and apparently cosovereign, conducted the defense of Babylon. After the fall of the capital, Nabonidus surrendered, was kindly treated by Cyrus, and even made governor of the province of Carmania. Some of his inscriptions show that he was a personage of historical interest. See Belshazzar; Cyrus.

NABOPOLASSAR, nă'bŏ-pō-läs'sạr, Babylonian king, founder of the New Babylonian empire. He was a Chaldæan, not of the kingly line, and erected an independent kingdom in Chaldæa in the second quarter of the 7th century B.C., thence extending his power to Babylon about 626. With his ally, Cyaxares of Media, he conquered Nineveh about 606, which brought about the destruction of the Assyrian Empire. The Chaldæan Empire became under him the greatest power in the Euphrates Valley. He died about 605 B.C., leaving the empire to Nebuchadnezzar, his son. Nabopolassar improved the irrigation of the country round Babylon and did much to beautify the city. Consult Rogers, ‘History of Babylonia and Assyria’ (1900); and likewise the histories of Hommel, F. (Berlin 1885); Winckler, H. (Leipzig 1892); Sayce, A. H. (London 1900); Johns, C. H. (ib. 1911).

NABOTH, an Israelite, owner of a plot of ground in Jezreel, during the reign of Ahab, king of Israel, about 897 B.C. This plot lay on the eastern slope of the hill of Gilboa and in addition to this he owned a vineyard. The palace of Ahab immediately adjoined this vineyard, which became an object of the king's desire and he offered to purchase it or give another in exchange for it. When Naboth refused to part with the «inheritance of his fathers,» Ahab was bitterly disappointed, but his wife sent a warrant in Ahab's name, sealed it with his signet and caused Naboth to be apprehended, brought to Samaria, tried for blasphemy and treason on the testimony of two suborned witnesses and stoned to death with his sons. Their mangled remains were devoured by the dogs and swine and the blood from their wounds ran down into the large tank or reservoir which still is seen on the slope of Samaria. This crime brought down the curse of Elijah upon the guilty couple (2 Kings ix, 2–26), which was fulfilled soon after in the fate of both. See Ahab, Jezebel.

NABU. See Nebo.

NABUA, nä'bwä, Philippines, a pueblo of the province of Ambos Camarines, island of Luzon, situated in the southern part of the province, on the Buhi River, 20 miles southeast of Nueva Cáceres. It is in a marshy region where rice is grown, and is connected with the neighboring towns by a good road. It is a military and telegraph station. Pop. about 19,000.

NABULUS, nä-boo-loos', or **NABLUS,** näb-loos', Palestine, the ancient Schechem, and one of the chief cities of Samaria, 30 miles north of Jerusalem, on the highest part of the fertile and fruitful pass between Mounts Ebal and Gerizim, leading from the Mediterranean to the Jordan. It is a busy trading and industrial centre, the seat of a governor, the see of a Greek bishop, and is visited by great numbers of pilgrims attracted by the tombs of Joshua and Joseph, Jacob's Well and the Tree of the Sanctuary, three miles south on the road to Jerusalem. As a Canaanite city it was destroyed by Abimelech, a son of Gideon the judge. Rehoboam was crowned king of Israel here, and during the Greek occupation Justin Martyr was born here. It figured conspicuously during the Crusades. It was the religious centre of the Samaritans (q.v.), whose descendants inhabit the southwest quarter of the town. Pop. about 20,000.

NACHTIGAL, näн'tē-gäl, **Gustav**, German explorer in Africa: b. Stendal, 23 Feb. 1834; d. at sea near Cape Palmas, 19 April 1885. He studied medicine; became a military surgeon; in 1861 went to Algiers; in 1863 became surgeon to the army of the Bey of Tunis; and in 1868 was sent with presents from the king of Prussia to Sultan Omar of Bornu in recognition of kindness shown to German explorers. His journey through Tibbu and Tibesti was over country hitherto untraversed by a European. He arrived at Kuka in 1870, thence explored Borku, Kanem and the country south of Bornu and on his way back to Cairo passed through Wadai. The years from 1875 to 1882 he spent in Germany arousing national interest in German colonization. He entered the consular service in 1882, becoming consul to Tunis, and in 1884 was German commissioner for the annexation of Togoland, Kamerun and Lüderitzland. He died on his way back to Europe. Nachtigal's work marked a distinct era in the exploration of northern Africa and even more notably in German colonial policy. He wrote 'Sahara und Sudan' (1879–89). His letters are collected in Berlin, 'Erinnerungen an Gustav Nachtigal' (1887). Consult also the life by Ruhle (1892).

NACIMIENTO MOUNTAINS. A prominent ridge in Sandoval County, N. Mex., lying between the headwater of Puerco and Jemez rivers. The length is about 40 miles and highest portions have an altitude of about 9,500 feet. To the north they merge into San Pedro Mountain. The rocks are uplifted granite with limestones, sandstones and volcanic tuffs on the flanks. Copper ore is mined on west slope at San Miguel and Senorito.

NACOGDOCHES, năk-ō-dō'chĕz, Tex., city, county-seat of Nacogdoches County, on the Texas and New Orleans, the Houston and the East and West Texas railroads, about 120 miles north by west of Beaumont and 130 miles north by east of Houston. It is in a rich agricultural region, in which the chief products are cotton and tobacco. A government experiment station for testing the tobacco is located here. The industrial interests of the city, outside the government station, are connected chiefly with the preparation of cotton and tobacco and lumber for market. Nacogdoches was first settled by Spaniards in the early part of the 18th century; it was first a mission, the headquarters for the converted Indians of the surrounding region. It figured in the United States quarrel with Spain over the Spanish possessions in the Southwest. Magee and Gutierrez captured it in 1812 when it came into the possession of the United States. Pop. 3,546.

NACRE. See MOTHER OF PEARL.

NACRITE, a class of white unctuous minerals possessing a pearly shining lustre. They are usually found with mica slate and also occur native in granite and gneiss, crystallizing in four-sided prisms. The constituents are usually alumina 28.844, silica 64.440, with varying portions of lime and the protoxides of iron and manganese. Nacrite is found in various localities, notably near Brunswick, Me., and in some parts of Ireland.

NADAL, Ehrman Syme, American author: b. Lewisburg, W. Va., 13 Feb. 1843. He was graduated from Yale in 1864 and was a secretary of the United States legation at London, 1870–71 and 1877–84. He has published 'Impressions of London Social Life' (1875); 'Essays at Home and Elsewhere' (1882); 'Zweibach or Notes of a Professional Exile' (1895).

NADCHES INDIANS. See CREEKS.

NADEN, Constance Caroline Woodhill, English poet: b. Edghaston, Birmingham, 24 Jan. 1858; d. London, 22 Oct. 1889. She studied at the Mason College, Birmingham, in 1881–87; became interested in sociological problems and lectured with effect. She was an investigator of Spencer's system of philosophy and became the advocate of a doctrine, taught also by Dr. R. Lewins, called "Hylo-Idealism," an attempt to furnish a metaphysical system reconciled with the science of modern times. She is chiefly remembered for her volumes of 'Songs and Sonnets of Springtime' (1881) and 'A Modern Apostle and Other Poems' (1887). The poems were commended for their promise by Gladstone in a review in the *Speaker*.

NADIA, nä'dē-ä, or **NUDDEA**, India, town and district of Bengal: (1) the town, capital of the district, on the Bhagirathi River, 54 miles north of Calcutta, is a place of sanctity, the seat of native Sanskrit schools and was the residence of the last independent Hindu king of Bengal in 1203. Pop. 14,105; (2) the district has an area of 2,982 square miles. The Ganges here known as the Padna skirts its northwestern boundary and from it branch the three "Nadia rivers," the Bhagirathi, Jalangi and Matabhanga, which irrigate the district and are valuable thoroughfares for communication and trade. Its capital is Krishnugger.

NADIR, *in astronomy*, that point of the heavens which is diametrically opposite to the zenith or point directly over our heads. The zenith and nadir are the two poles of the horizon; the zenith, nadir and centre of the earth are in one straight line.

NADIR SHAH, nä'dėr shä, or **TAMASP KULI KHAN**, king of Persia: b. Khorasan, 1688; d. Fethabad, 19 June 1747. He was of Turkish blood and poor family; early showed his cunning by his attempts, while in the service of different governors of Khorasan, to get this province for himself, but was unsuccessful. Putting himself at the head of a band of robbers he got possession of several strongholds in Khorasan; and in 1726 entered the service of Tamasp II, for whom he checked the Afghans and defeated the Turks and from whom he received four provinces. When Tamasp was defeated at Hamadan by the Pasha of Bagdad and was forced to cede the provinces on the Arauxis to the Turks and to make a disgraceful peace, Nadir dethroned him, put his son Abbas III in his place and took the regency upon himself. The lost provinces were won back from the Turks and in 1736 upon the death of Abbas Nadir came to the throne, invaded Afghanistan and conquered it, took most of India from the grand mogul, Mohammed XIV, pillaged Delhi and was everywhere so successful that his empire reached from the Indus and Oxus to the Euphrates and Caspian. He made peace with the Turks in 1746, but was assassinated by the officers of his guard, who were weary of his brutal cruelty. Consult Maynard, 'Nadir Shah' (1885).

NAEGELE, nā'gē-lē, **Charles Frederick,** American painter: b. Knoxville, Tenn., 8 May 1857; d. about 1912. He studied figure and portrait painting under C. Myles Collier, William Sartain and William M. Chase in New York. He has received many awards in competitive exhibitions and has painted portraits of Peter Cooper, Charles L. Tiffany, ex-Governor Roswell P. Flower, Gen. Joseph D. Bryant, Gen. Edwin A. McAlpin, John W. Gates and others. For his oil painting 'Divinity of Motherhood,' he won a gold medal at Boston.

NÆNIA, or **NENIA** (Latin), a funeral song among the ancients, sung generally by women. Nænia was also the goddess of lamentation.

NÆVIUS, nē'vĭ-ŭs, **Gneius,** early Roman poet: b. probably in Campania between 274 and 264 B.C.; d. Utica, Africa, 204 B.C. or 202 B.C. He wrote in the old Saturnian verse an epic on the First Punic War; but was better known as a dramatic writer, particularly for his comedies. Most of his plays, of which the earliest was produced in 235 B.C., were translations or adaptations from the Greek. His attacks on the Metelli, of the Roman nobility, provoked their anger and he was banished from the city and retired to Utica. Fragments only of his works have come down to us. These have been edited by Klussmann, Vahlen and most recently by Ribbeck ('Fragmenta Scænicorum Romanorum').

NÆVUS, a birth-mark, port-wine mark or mother's mark. This disfigurement, which occurs most frequently on the head and trunk, but may also appear on the extremities, is essentially an enlargement of the minute veins or venous capillaries, which are dilated and anastomose or unite among themselves to form a vascular patch generally of a deep-red color. The lesion is confined to the upper layer of the true skin. No pulsations are observable in the nævus, but if the circulation in the neighborhood is obstructed in any way, turgescence is seen and the color deepens. The familiar name of «mother's mark» or «longing mark,» is applied to nævus from a former belief that the lesion was the result of fear, fright, unnatural longing or some such irritation acting upon the mother's constitution and communicating its effects to the unborn child, in the shape of this mark. Nævus, apart from questions as to its exact cause, appears to be invariably congenital in its nature. After birth it usually enlarges and after attaining a certain size may remain to constitute a permanent lesion or it may be absorbed with or without inflammatory action. The name birth-mark is in some cases a misnomer because the nævus may appear at different periods of life. Nævus has been treated in various ways, by excision with the knife, ligature, caustics, etc. The ligature has until recently been most commonly employed for its removal, threads being passed under the base of the nævus and tied so as to produce strangulation of the vessels. Electropuncture and electrolysis have also been much used, but the best of all discovered means is the use of carbon dioxide snow, a cone of which is made and pressed upon the nævus for a quarter or half a minute. This causes a blister, which dries and come off, leaving no scar. In cases where a nævus is of limited extent and does not produce disfigurement or where from its situation it may not be seen at all in ordinary circumstances, the surgeon's advice generally is to let it alone. In subcutaneous nævus the lesion is more deeply seated. Subcutaneous nævus generally accompanies the more superficial form, but may bleed spontaneously and weaken the patient unless removed.

NAFA, nä'fä, **NABA,** or **NAVA,** Japan, the principal seaport town of the Liu-Kiu Islands, on Okinawa. It is on the west coast of the island, and carries on a considerable export trade in silk, cotton and sugar. Pop. about 50,000.

NÄFELS, nä'fĕls, Switzerland, parochial village in the Canton Glarus, junction of the Zürich-Glarus-Linthal and the Näfels-Weesen railways. Its industries are chiefly cotton spinning, printing and structural iron material, besides agriculture. It was here that, on the 9 April 1388, 400 Glarus natives defeated 6,000 Austrians, a feat still commemorated yearly. In 1799 Suwarov was defeated by the French under Molitor here in the Russian attempt to force a way into France. Its inhabitants numbered 2,818 in 1910. Consult Heer, G., 'Zur 500 jährigen gedächtnissfeier der Schlacht by Näfels' (Glarus 1888).

NAFTIA, näf'tē-ä, **Lago,** or **LAGO DEI PALICI,** Sicily, a historic lakelet of volcanic origin, in an ancient crater over 900 feet in circumference, near Palagonia, in Catania. Its nauseating naphtha-like emanations are fatal to birds and small animals; its waters thick and greenish, and in a frequent state of ebullition from the under-pressure of escaping carbonic acid gas. The lake was regarded with superstition by the ancients, and here the Siculi, the earliest known inhabitants, had a temple to two chthonic gods, the Palici of the Romans, which was the seat of the conspiracy and revolt against Rome 104 B.C. Consult Freeman, E. A., 'History of Sicily' (Vol. I, Oxford 1891).

NAGA, nä'gä, Philippines, (1) a pueblo of the province of Cebú, situated on the east coast, 12 miles southwest of the town of Cebú. It is a port of call for steamers and coasting craft going to Cebú by the southern passage, and is on the east coast road. Pop. 16,884. (2) The former name of Nueva Cáceres (q.v.).

NÂGA, *in Hindu mythology,* the name given various deified serpents, which are represented as the sons of the Muni Kasyapa and his wife, Kadrii. Their king is Sesha, the sacred serpent of Vishnu.

NAGA, INAYA or **BÍCOL RIVER,** a river of southern Luzon, Philippines, rising in the mountains of the province of Albay, within four miles of the Pacific Coast and flowing northwest to Bató Lake, on the boundary between Albay and Ambos Camarines. Passing through the lake, it continues its northwest course across Ambos Camarines, and empties into San Miguel Bay. It is navigable to Nueva Cáceres for vessels of 150 to 200 tons.

NAGANO, nä'gä-nō, Japan, a city of Hondo, 96 miles northwest of Tokio. It has an active trade in silks, woolens and other textiles, and is a noted Buddhist pilgrim resort, visited for its celebrated Zenkoji Temple, dating from the 7th century.

NAGASAKI, nä-gä-sä'kē, Japan, capital city of the province Hizen and one of her principal and deepest seaports on the west coast of the island Kiushiu, located at the end of a long narrow bay and beautifully surrounded by high hills on three sides, and protected on the west side by the island Takaboko, from whose steep heights many hundreds of Christians were once thrown to death. The town has narrow streets and a Chinese quarter in its rear; the foreign quarter is roomy and clean. It contains a hospital, school of medicine, lunatic asylum, arsenal, prison, botanical gardens and modern waterworks. Its considerable imports consist of cotton, wheat, flour, whale-meat, sugar, beer, machines and railway equipment, petroleum, cement, coal, bone for fertilizer, etc. Of exports the chief commodities are raw silk, tea, sea-products (except fish), furs, salt, vegetable wax, paper, etc. It has steamboat connections with Korea, China, Hongkong, Vladivostok and North America. The harbor was first opened to the Portuguese (1639) and up to 1859 was opened to the Dutch and Chinese only but the treaty of 1858 rendered it accessible to all foreign commerce. Pop. 161,000.

NAGCARLÁN, năg-kär-län', Philippines, a pueblo of the province of Laguna, Luzon, situated in the centre of the province between the headwaters of the Santa Cruz and the San Diego rivers, 12 miles south of Santa Cruz. It is on the road between Majayjay and San Pablo. Pop. 13,000.

NAGEL, nä'gĕl, **Albrecht Eduard**, German ophthalmologist: b. Danzig, 14 June 1833; d. Tübingen, 24 July 1895. He studied medicine at Königsberg and Berlin and established a practice in Danzig in 1856. In 1864 he was privat-docent at Tübingen and 1874 he became professor of ophthalmology there. He developed the theory of the identity of the retinas. He edited the 'Mittheilungen aus der ophthalmiatrischen Klinik in Tübingen' after 1880, and published 'Das Sehen mit zwei Augen' (1861); 'Die Anomalien der Refraction und Accommodation des Auges' (1880); 'Die Vordbildung zum medicinischen Studium' (1890).

NAGEL, nä'gĕl, **Charles**, American lawyer and cabinet officer: b. Colorado County, Tex., 9 Aug. 1849. He was educated at Saint Louis and studied Roman law and political economy (1873) at the University of Berlin, when he was admitted to the bar and practised at Saint Louis. He was (1903–05) member of the firm Finkelnburg, Nagel and Kirby, and (1903–05) of Nagel and Kirby. From 1885–1909 he was lecturer at Saint Louis Law School and was member of the Missouri house of representatives from 1881–83. He was (1893–97) president of Saint Louis city council and (1908–12) member of the Republican National Committee. President Taft made him (1909) Secretary of Commerce and Labor, which position he retained during the life of that administration. In 1872 he was given the degree of LL.B. by Saint Louis Law School, and was made LL.D. (1911) by Brown University, Villanova University, Pennsylvania, and Washington University, Saint Louis.

NÄGELI, nā'gĕ-lē, **Karl Wilhelm**, Swiss botanist: b. Kilchberg, near Zürich, 27 March 1817; d. Munich, 10 May 1891. He studied in Zürich, Geneva and Berlin; began (1842) the teaching of botany in Zürich; became extraordinary professor at the university there in 1848, full professor in 1852 at Freiburg, and at Zürich three years later. Afterward he held the professorship of botany at Munich. His most important work for science was in the physiology and morphology of plants. His writings deal chiefly with morphological and cytological subjects, and the transformation of species is fully treated in his 'Merchanisch-physiologische Theorie der Abstammungslehre' (1883). Most of his publications appeared first in scientific journals, those contributed to the Royal Bavarian Academy of Sciences being published as three volumes of 'Botanische Mitteilungen' (1861–81).

NAGLEE, năg'lē, **Henry Morris**, American soldier: b. Philadelphia, 15 Jan. 1815; d. San Francisco, 5 March 1886. Entering the Union army early in the Civil War, he participated in the Peninsular campaign of 1862, and in the following year was appointed to the command of the 7th Army Corps and of the District of Virginia. He retired from the army in 1864, and later went to California, where he cultivated a vineyard at San José, and gave his name to a well-known brandy.

NAGOYA, nä-gō'yä, Japan, the chief town of Owari province, in the island of Hondo, near the head of Owari Bay, 92 miles by rail east of Kioto. It was formerly a city of great importance, being for a time the capital of the empire. It is still the fourth city in Japan in respect of population and an important centre for the production of pottery and fancy ware, silk and cotton goods, and other manufactures. The chief edifices are the 17th century castle of Owari with its valuable art collection, and the Higashi Hongwanji Buddhist temple. Pop. (1920) 429,990.

NAGPUR, näg- or nŭg-poor', or **NAGPORE**, India, a city, district and division of the Central Provinces. (1) The city, capital of the district and division, and also of the Central Provinces, 520 miles by rail east of Bombay, although at an elevation of 1,100 feet above sea-level, occupies an unhealthful situation on the banks of the Nag. The municipal limits include, besides the town proper, the native suburb of Sitabaldi, the European station of Sitabaldi, the small suburb of Takli, and a considerable area of land under cultivation. In the centre rises Sitabaldi Hill, crowned with the fort, which is garrisoned by a small detachment from the British regiment at Kamptee, nine miles distant. There are some Hindu temples and mausolea built in the best style of Mahratta architecture, and several schools. The chief manufactures are cotton and woolen cloths. There is a trade in wheat and other grain, salt, country cloth, European piece and miscellane-

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ous goods, silk, etc., and coal is obtained from a bed at a depth of 200 feet, which is estimated to contain 17,000,000 tons. Here, in 1817, a British force of 1,350 men defeated a Mahratta army of 18,000 men. Nagpur was formerly the seat of a line of rajahs, which became extinct in 1853, when their territory was annexed to the British dominions. Pop. 101,415. (2) The district of Nagpur has an area of 3,483 square miles; pop. about 800,000; (3) the division of Nagpur, divided into five districts, has an area of 23,521 square miles. Fruits, vegetables, cotton, rice, maize oilseed and oranges are cultivated. The locality is also rich in minerals, coal, antimony, ochre, gold being extensively mined. The territory was annexed by the British in 1853, previous to which it had been part of the Mahratta kingdom under the rule of the rajahs of Berar. Pop. 3,109,838.

NAGUILÍAN, nä-gē-lē'än, Philippines, a pueblo of the province of Unión, Luzon, situated on the Bauang (or Baoang) River, four miles from the mouth and 10 miles southeast of San Fernando. Pop. 11,885. A small town (pop. 2,200) in the province of Isabela, Luzon, has the same name.

NAGYAGITE, a sulpho-telluride of lead and gold with about 7 per cent of antimony, with the formula $Au_2Pb_{14}Sb_3Te_7S_{17}$. Besides these elements it often contains traces of copper and silver. It is found native in foliated masses and is hence sometimes called «foliated tellurium,» also granular. It crystallizes, but rarely, in tabular diametric forms and its specific gravity is 6.85 to 7.2. It melts easily under the blow-pipe and burns with a blue flame. In color it is blackish lead gray, and exhibits a brilliant metallic lustre. It is found in Colorado and Virginia, but derives its name from Nagyag, Transylvania, where it was first found.

NAGYBANYA, nŏj'y'-bän'yạ, Hungary, a royal free town formerly known as Frauenstadt (Magyar Aszonypataka), located in the county Szatmár on the Szatmár-Nagybanya and the Nagybanya-Zsibó railways. It was at one time fortified, is handsomely built, and contains beautiful squares and a Minorite monastery. Its industries consist of mining and fruit culture, the manufacture of linens and cotton fabrics, pottery and alcohol, besides having considerable trading. The mines produce gold, silver, lead and copper. Pop. about 30,000.

NAGYKÁROLY, nŏj'y'-kä'rōl-y', Hungary, city in the county Szatmár, on the Debreczin-Szatmár, the Magykároly-Zilah and the Nagykároly-Csap railways. It has a handsome church, a Piarist monastery, the Károlyi Palace and park. Its industries consist chiefly of the manufacture of coarse peasant linen and woolen cloths, leather, art furniture, decorative locks, bricks, besides its electricity, wine and tobacco works. Its population in 1910 was 43,692 for the commune. This has been the seat of the Károlyi family since the 14th century.

NAGYKIKINDA, nŏj'y'-kē'kēn-dạ, or **GROSS-KIKINDA,** Jugo-Slavia, city in the county Torontál, junction of the Szegedin-Temesvár and the Gross-Kikinda–Gross-Becsterek railways. It has a modern town-hall, obergymnasium, court of justice, etc. Its chief trade is in grain, cattle and milling. It was at one time the principal location of a privileged Serbian district. Its inhabitants in 1910 amounted to 32,987, consisting of Serbians, Germans, Magyars, etc.

NAHANT, nạ-hănt', Mass., town, in Essex County, on Massachusetts Bay. It is on a peninsula, which extends into the bay about four miles. The surface is uneven, the east coast rugged, in some places bold cliffs are along the shore; the west coast is low and more regular. There are two small villages in the town, one Nahant, the other Little Nahant. The whole peninsula is a residential section; many of the handsome dwellings are the summer homes of Boston men. Nahant is four miles from Lynn, the nearest railroad station, and about 10 miles northeast of Boston. Formerly it was part of Lynn, but in 1853 it was made a separate town. Pop. 1,184. Consult Hurd, ‘History of Essex County, Mass.’ (Philadelphia 1888).

NAHR-EL-ASI, när'ĕl-ä'sē. See Orontes.

NAHUA (nä'wä) **INDIANS,** a Central American collective name given to the Indian tribes which were the most powerful in Mexico at the time of the Spanish Conquest. See Aztec Confederacy.

NAHUA MYTHOLOGY. See Mexican Mythology; Yucatan; Palenque; Quetzalcoatl; Maya; Cholula.

NAHUEL-HUAPI, nä-wāl' wä-pē', or **TIGER LAKE,** Argentina, a lake on the boundary between the territories of Neuquen and Rio Negro, on the east slope of the Andes. It is 75 miles long, 10 miles broad and has an area of 300 square miles, dotted with several islands. It is fed by numerous mountain torrents and is drained by the Limay affluent of the Rio Negro. In 1690 the lake was discovered by Jesuit missionaries.

NAHUM, nā'hŭm (Hebrew for «rich in God's comfort»), one of the 12 minor Hebrew prophets of the Old Testament, whose only record is the book, attributed to 607–606 B.C., that bears his name, a reference in Nehemiah vii, 7, as «Rehum» being a copyist's error. Nahum is described as «The Elkoshite,» either the son of a man named Elkosh, or native of a village of that name in Galilee, the location of which is uncertain. Saint Jerome states that the village in Galilee which bore the name of Elkesi in the 4th century A.D. was the prophet's birthplace, and the Galilean village Capernaum, signifying the «village of Nahum,» has also been vaguely speculated upon. The tomb of the prophet is pointed out at Alkush near Mosul — ancient Nineveh — and his life has been associated with the great city, the destruction of which he prophesied. His book entitled ‘The Burden of Nineveh. The Book of the Vision of Nahum the Elkoshite,’ should be compared with that of Jonah which illustrates the remission of God's judgments, while Nahum describes their execution, in a style full of animation, fancy and originality, and at the same time clear and rounded. His language throughout is classical and in the purest Hebrew, belonging to the second half of Hezekiah's reign, or to the time immediately following the defeat of Sennacherib before Jerusalem. Nineveh was at that time the capital of the great and flourishing Assyrian Empire. It was a city of vast extent and population; the centre of the principal commerce of the world. Its wealth, however, was not altogether derived from trade. It was a «bloody city,» «full of lies and robbery,» chap. iii, 1. It plundered the neighboring nations; and is compared by the prophet to a family of lions, which «fill their holes with prey, and their dens with ravin,» chap. ii, 11, 12. At the same time it was strongly fortified, its colossal walls, 100 feet high, with their 1,500 towers, bidding defiance to all enemies. Yet so totally was it destroyed that, in the 2d century after Christ, not a vestige remained of it; and its site was for centuries a matter of doubt and uncertainty. The book is surpassed by none in sublimity of description. It consists of a single poem which opens with a superb vision of God's coming to judge the nations, vs. 2–8. Then follows vs. 8–14, an address to the Assyrians describing their confusion and overthrow; vs. 12–13 parenthetically consoling the Israelites with promises of future rest and relief from oppression. Chapter ii depicts in vivid colors the siege and capture of Nineveh by its foes, the Medes and Chaldæans, and the consternation of the inhabitants. Chapter iii describes the utter ruin of the great city and the various contributing causes. The fall of No-Ammon, Thebes in Egypt in 668 B.C., about half a century before, under the judgment of God, is cited, vs. 8–10, to illustrate the punishment coming on the Assyrian Empire and the deliverance and restoration of Israel. With a wide view of the working of Providence, an avoidance of all moral or homiletic utterances, this powerful prophecy advances with majestic unity from its noble prœmium to its close. Consult Davidson, A. B., «Nahum, Habbakuk and Zephaniah» in 'Cambridge Bible' (1896); Driver, S. R., «Nahum» in 'Century Bible' (1906); Smith, G. A., 'The Book of the Twelve Prophets' (2 vols., 1876–77); Haller, «Nahum» in 'Die Religion in Geschichte und Gegenwart' (1913); also the numerous commentaries, notably by Bickell, Billerbeck and Jeremias, Gunkel, Marti, Norvack, Wellhausen, etc.

NAIADACEÆ, a small family comprising one genus, Naias, of submerged fresh-water plants, differing from the *Potamogetonaceæ* (q.v.) in having the flower declinous, with one stamen and one ovary. There are about 12 species and varieties found generally over the world. In the United States some members of the family are found in the fresh-water lakes and ponds from New York to Florida, others in the Mississippi Valley and others still in California.

NAIL, an elastic horny plate on the upper or dorsal surface of the end of a finger or toe, as in man and monkeys. Hoofs, claws, talons, sheath-horns and the bills of birds are analogous. Nails and claws of all kinds are modifications of the epidermis, identical in formation and mode of growth. The root of the nail rests in a matrix which is a fold of the dermis, particularly rich in vascular papillæ from which the nail-cells are produced. The pink color of a healthy nail is due to the blood beneath. The little white area toward the root of a nail, called lunula from its crescentic shape, has less blood under it. When nails are destroyed new ones will be formed if the matrix is uninjured. Nails are a support and a defense to the ends of the fingers and toes, assist in picking up small objects, and if healthy and in good condition add comeliness to the parts to which they are attached. To most animals possessing them they are of great importance, giving a needed rigidity to fingers and toes, and adapting them to a great variety of necessary utilities, as firmly seizing and holding prey (perfected in the retractile apparatus of feline claws), scratching, digging, searching crevices for food and as formidable weapons. In horses, cattle and other ungulated animals, they enclose some or all the digits and are called hoofs (q.v.). In the sloths the nails assume a relative size and are used as a chief means in arboreal progression. In the Amphibia — as in some toads, efts, etc.— the nails are represented in their simplest form and appear as mere thickenings of the skin at the extremities of the digits.

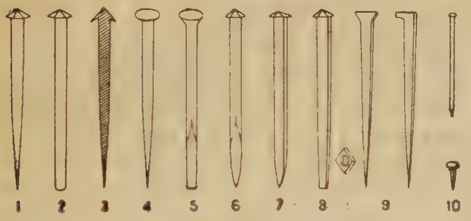
In man the nails appear about the third month of fœtal or embryonic life. After birth the nails of the hand grow at the rate of about one millimeter per week, those of the foot about one millimeter per month.

The health of the nails is affected, as is that of the skin, by local or general diseases. They may become thickened (hypertrophy) as the result of inflammation or a degeneration of nerves; diminished in size (atrophy) from traumatic influences; malformed as the result of disturbed function of the matrix; degenerated from faulty nutrition and discolored in various diseases, the discoloration probably being in the tissues beneath. Nail-biting is a bad habit not only leading to a morbid condition of the nails themselves but also sometimes being an indication of some types of nervous disease. The nails are also subject to parasitic diseases. A hang-nail is a sliver of skin attached at one end; it should be cut off close to the point of attachment. The familiar white areas on the nails are considered to be injury received by the nails in being manicured. The painful affection called ingrowing nail usually occurs in the great toe, not through alteration in the nail itself, but from constant pressure of the adjacent soft parts against its edge by a tight shoe. The irritation often results in the formation of an ulcer, extremely sensitive, and subject to continual aggravation from the embedded nail, and in some cases necessitates a slight operation to excise a portion of the nail and the nail fold.

NAILS, headed spicules of metal, varying in size from those a little larger than ordinary pins to those several inches in length and from 1/40 to ¼ of an inch in thickness. Up to the beginning of the 19th century they were made by hand as a household industry in various countries. In England, Birmingham was the centre of the industry, at one time giving employment to over 60,000 persons, and requiring a weekly supply of 200 tons of nail-rods from the iron-works of that district. In the United States, New England held a corresponding position and is even to-day the centre of the industry in America, with Taunton, Mass., as the great tack-making centre of the world. Almost all of the nail output of England was consumed at home and similar conditions obtained in the United States, France and Germany.

Hand-made nails were known as wrought or forged nails and were made from metal plates rolled to the required thickness and then slit by slitting-rollers into nail-rods or split-rods of various sizes, corresponding to the required size and character of the nails to be forged and were sold to the nail-makers in bundles. The hand-nailer's outfit consisted of a forge for heating the nail-rods, an anvil (a small cube of steel), a hammer resembling that of a file-cutter (the face being sloped toward the handle), and a few «swages» (stamps or dies for producing ornamental or stamped heads).

To make a nail, a nail-rod was heated on the forge, hammered on the anvil and a portion of it the length of the required nail was cut off on a chisel attached to the anvil. The head was shaped in a vise which gripped the shank of the nail and had a counter sunk in the jaws of the vise into which the head was hammered to shape it. Various forms of heads were produced by employing different kinds of counters. These forged or wrought nails included at least 300 different types, with at least 10 sizes in each type, representing a total of over 3,000 different names. The retail terms — fourpenny, sixpenny, tenpenny, etc.— were not only indefinite in themselves, but varied in different countries and even in different localities of the same country. Therefore, nails were generally designated by terms defining their use, as deck, scupper, pail, mop, hurdle, etc., or according to the forms of their heads, as clasp, rose, diamond, etc., or the shape of their points, as flat, sharp, spear, etc. Their thickness was expressed as fine, barbed and strong, and their length in inches, generally in connection with the weight (expressed in pounds) of 1,000 of the nails referred to. The principal forms of these old-time English nails are illustrated by the accompanying drawing and their uses may be briefly stated as follows: (1) «Rose-sharp» and «fine-rose»: the former used for coopering, fencing and other rough work employing hard wood; the latter, with broad spreading heads of greater holding power, used in pine and other soft woods. (2) «Flat-point rose»: used in wood liable to split by the wedge-like action of sharp-pointed nails. They were driven with the edges of their flat points across the grain of the wood and not only avoided splitting but also held more firmly. (3) «Clasp» nails: commonly used by carpenters in deal and similar woods. The edges of their heads projected downward and, when driven below the surface of the wood, held tightly by clasping a portion of it altogether, and also allowed a plane to pass over them in finishing work. (4) «Clout» nails, with flat circular heads and round sharp-pointed shanks: used for nailing iron-work and other substances to wood. (5) «Counter-clout» nails, with countersinks under their heads, and chisel points: extensively used by wheelwrights and smiths. (6) «Fine-dog» and «strong-dog,» with solid, slightly countersunk heads, round shanks and speared points: used for nailing down stout iron-work, in which the heads are not required to lie flush with the face of the metal. (7) «Kent-hurdle» and «Gate» nails, with broad thin rose heads, flat shanks and good spear-points: used for nailing together and clenching the oaken bars of hurdles, fences and gates. (8) «Rose-clench» nails, with points cut square: used in nailing wood-sheathing and the manufacture of packing cases and boxes, in which the soft wood is liable to split unless bored before being nailed. The square heads of the nails punch out their own holes by driving a portion of the wood before them. The term «clench» was derived from the mode of their employment in boat-building, where they were clenched by hammering down or by riveting the end over a «rove» (a diamond-shaped metal plate), thus drawing the planks together firmly. (9) «Horseshoe» nails, with square or countersunk heads: made of the best refined iron and capable of being drawn out fine without breaking in the hoof. (10) «Brads and tacks»: a class of small very useful nails, employed for a variety of purposes too numerous to mention. The latter were sometimes made so small that 1,000 did not exceed 20 grains in weight. In the United States nails are designated as to kind as wrought, cut and wire nails; as to type by the purpose for which they are to be used, as lath nails, shingle nails, etc.; and as to surface, as smooth, barbed, etc. In sizes they range from the two-penny (2-d) to the sixty-penny (60-d) nails. Above these sizes they are called spikes; below them, brads. The smooth wire two-penny nails run almost exactly 1,000 to the pound; of larger sizes the count runs about as follows: three-penny, 600; four-penny, 300 to 450, according to gauge of wire; five-penny, 275 to 400; six-penny, 175 to 300; eight-penny, 100 to 150; 10-penny, 70 to 90; 12-penny, 65; 16-penny, 50; 20-penny, 30; 40-penny, 18; 60-penny, 11. Six-inch spikes run about nine to the pound and 12-inch spikes three to the pound. For many years nails have been marketed by the keg containing 100 pounds. Through the use of a recently developed packing machine, which, through the agency of magnetism, arranges the nails in parallel, nails are in the market in cardboard cartons from 10 pounds upward and in large quantities in wooden boxes which occupy only half the space required by the «keg» with its helter-skelter contents. The small nails or brads are usually packed in telescope containers, holding from one-quarter pound up to one pound.



Principal Forms of Nails.

The credit of inventing nail-making machinery appears to belong to the United States, a patent having been granted in 1786 to Ezekiel Reed, of Bridgewater, Mass., for a «cut-nail» machine. About the beginning of the 19th century nail-making machines had been generally introduced in England, but the first English patent was granted to John Clifford in 1790. In making cut nails strips of metal of a breadth and thickness corresponding to the length and thickness of the required nail and about a foot in length are heated to a black heat and fed into the machine end first. A slicer cuts off the nail-blank, which in falling is clutched at the neck and held until a moving die strikes its upper end and forms the head; it is then liberated and passes out into the trough. In small nails the taper of the shanks and points is obtained by cutting the nail-blanks alternately, the metal strip (of uniform thickness) being turned over after each cut so that the points and heads are taken from the opposite sides of the blank; while in the larger nails the metal strip is rolled so that its cross-section corresponds to the required taper. These machines turn out nails at a rate of 10 to 1,000 per minute, according to the size of the nails. Cast nails are produced by the ordinary process of molding in sand. They are relatively brittle, but are cheap, and are used for rough purposes, such as lathing and in the manufacture of stout boots and shoes. Wire nails were first made in France, hence sometimes called «French nails.» They were used in the woodworking trades and up to 1850 were made by hand. The wire was cut into the required lengths; a wire-blank was pinched in a vise, with a small portion projecting, which was flattened into a head by a few blows of the hammer. Subsequently machines were invented into which the wire was fed and the cutting, heading and pointing were performed automatically.

In the United States William Hersel, of New York, produced the first hand-made wire nails in 1850. Shortly afterward French machines were imported, but they were soon superseded by those of American make, which were awarded medals over those of French and German manufacturers at the Centennial Exhibition in 1876. The new industry, however, was of slow growth. Up to 1885 there were about 25 firms engaged in it, but since then these nails have been widely adopted in the manufacturing trades. The United States Census of Manufactures for 1919 reported 65 establishments devoted exclusively to the manufacture of nails, tacks and spikes. The factories employed a total of 3,355 wage-earners to whom was paid annually in wages the sum of $3,398,000. The aggregate capital invested was $13,216 000. The value of the year's production was $17,583,000, of which $8,708,000 had been added by manufacture. In addition to this product, however, the steel rolling mills of the country made nails to the value of $1,334,168 and railroad spikes to the value of $10,148,232; brass and bronze factories made brass nails and the wire mills made wire nails to the value of several millions; and other metal working establishments made a value of $488,758. The aggregate output of these concerns not classed as nail-makers was shown to be more than four times the output of the recognized nail industry. With the exception of horseshoe nails (9,499 net tons valued at $2,961,023 in 1919) which to a considerable extent continue to be made by hand, from fine grades of wrought iron, all nails are now made of mild steel by machines. In the United States the production is in excess of the consumption and American wire nails, especially, have been exported to European and other countries in increasing quantities for several years. The money value of the export of 1891 was but $420,697, while that of recent years has exceeded $5,000,000 annually. Consult Smith, B., ‘Wire: Its Manufacture and Uses’ (New York 1891); Swank, J. M., ‘History of the Manufacture of Iron in All Ages’ (Philadelphia 1892).

NAIN SING, Hindu explorer: b. Numaon; d. Morabad, 1 Feb. 1882. He received from a military officer, Colonel Montgomerie, instruction and stimulus for the work of exploration, which he afterward carried on in central Asia, first in Cashmere and Ladak (1856–57), and later in Tibet, making a journey (1865–66) to Lhasa (q.v.), which won him recognition from the Royal Geographical Society. This was followed by other important journeys, chief of which was that across the Tibetan Plateau (1874–75), of which he was the first explorer. The *Geographical Magazine* (London 1876) published an account of this journey, with a map.

NAINI TAL, India, a town of the United Provinces in the district of Kumaon. It has a beautiful situation beside a lake, 6,409 feet above sea-level, between spurs of the Himalayas, 70 miles north of Bareilly. It is a popular health resort, the summer headquarters of the provincial government, and has a military convalescent hospital. A disastrous landslip here in 1880 destroyed 150 lives. Pop. about 14,000.

NAIPALI (nī-pä'lē) **LANGUAGE,** a dialect spoken in Nepal, India. It resembles the Hindu. The literature of the language is very scanty. Consult Turnbull, A., ‘A Nepali Grammar and English-Nepali and Nepali-English Vocabulary’ (Darjeeling 1887).

NAIRNE, nārn, **Carolina Oliphant,** BARONESS, Scottish poetess: b. Gask, Perthshire, 16 Aug. 1766; d. there, 26 Oct. 1845. Her father was a staunch Jacobite, and named her after the young Pretender. In 1806 she was married to her cousin, William Murray Nairne, who in 1824 became Baron Nairne. Her poems were issued in 1846 as ‘Lays from Strathearn,’ and in 1869 Charles Rogers edited a volume entitled ‘The Life and Songs of the Baroness Nairne,’ of which a revised edition appeared in 1886. Among her poems are several of the most popular Scottish songs, such as ‘The Land o' the Leal’; ‘The Laird o' Cockpen’; ‘Caller Herrin’; ‘The Auld House’; ‘Charley is my Darling.’ Consult Oliphant, K., ‘Jacobite Lairds’ (Grampian Club 1870).

NAIROBI, nī-rō'bē, British East Africa, capital city of the province Ukamba, a station of the Uganda Railway, and 327 miles by rail northwest of Mombasa. It is located on the Athi plains at the foot of the Kikuyu hills. It has a town-hall, Protestant, Catholic, Mohammedan and Hindu places of worship, schools, hospital, waterworks, etc. Its bazaar is the centre of a thronging populace of traders. The European inhabitants find their dwellings in the higher lands. Pop. about 30,000.

NAIRS, nä'ärz, a Mohammedan caste in Malabar, who have peculiar marriage customs, polygamy and polyandry thriving side by side.

NAKED BAT, strangest of all chiroptera is the *chiromeles torquatus* or collared bat of the Malayan region. It measures five and one-quarter inches in length exclusive of the tail and has 26 teeth. Except the collar of thinly-spread hairs surrounding the neck the puckered skin is practically naked. Its muzzle is long and pig-like but the most curious characteristic of this repulsive creature is the deep pouch on the underside of the body below the arm-pits existing in both sexes and holding the young while suckling. These strange creatures are found on the islands of Java, Sumatra and Borneo in dense forests where they repose till the sun reaches the horizon.

NAKONG, nä-kŏng, one of the four species of harnessed African antelopes. It inhabits the swamps of Central and South Africa and East Africa and is known also as the sititunga (*Tragelaphus spekei*). This species has the distinctions of having a perfectly uniform grayish brown color, while the young are faintly striped and spotted, the hair being more silky and longer than the others; the horns, forming nearly two complete turns, are smooth, slender and strongly ridged. The male stands about three foot seven inches. They go in pairs never in herds. They are highly prized by the natives as game.

NAKSHATRA (Sanskrit, «Celestial luminary» or «star»), in the Vedas simply means a star, but later was used of what in the mythological astronomy of India are called mansions of the moon, in which that planet periodically rests in its course through the heavens; these were small clusters of stars or asterisms, 27 or 28 in number. They were mythologically personified as the daughters of Daksha, wives of the moon. Their introduction into the Hindu system has been variously accounted for. Consult Thibaut, G., ‹Astronomie, Astrologie und Mathematik›; ‹Grundriss der Indo-Arischen Philologie und Altertumskunde› (Strassburg 1899).

NAKSKOV, nạk'skôv, Denmark, seaport town on the west coast of the island of Laaland, on Nakskov Fiord and on the Nykjöbing-Nakskov Railway. Its chief industries are the manufacture of sugar and machines, a trade in grain, besides its ship-building and shipping. It was once fortified and was captured by the Swedes in 1658. Its inhabitants in 1911 numbered 9,480.

NALA, nä'lạ, in Hindu mythology, a legendary king of ancient India, whose love for Damayanti, the daughter of Bhîma, king of Vidarbha, and the adventures arising therefrom, forms a celebrated episode of the ‹Mahâbhârata› (q.v.), as also of a separate poem, the ‹Nalodaya,› attributed to Kalidasa. Consult Macdonell, A. A., ‹A History of Sanskrit Literature› (London 1900).

NALTUNNETUNNE (näl-tŭ-nä'tŭ-nä') **INDIANS,** an American tribe of the Athapascan family, formerly residing on the Pacific Coast south of Rogue River, in southwest Oregon, between the Tututni on the north and the Chetco on the south. They had no separate villages, and spoke a dialectic variation of the Tututni language. Their tribal name signifies «people among the mushrooms.» A few descendants of the race now live on the Siletz reservation, Oregon.

NAMALAND. See SOUTH WEST AFRICA.

NAMANGAN, nä-män-gän', Russian Turkestan, a town of Ferghana, on the Sir-Daria, near the confluence of the Narin, about 50 miles northeast of Khokand. It is in a rich oasis, and is the trading centre for the surrounding nomadic tribes. Near it naphtha and coal are found. The principal industries are soap and leather manufactures. Pop. 78,942.

NAMAQUALAND. See SOUTH WEST AFRICA.

NAMAS. See HOTTENTOTS.

NAMAYCUSH, the great lake-trout (q.v.).

NAMES of persons in the very earliest ages no doubt had some significance and meaning, but no record is handed down to us. The Old Testament names are almost all original, that is, given in the first instance to the individual bearing them, and either originated in some circumstance of birth as an expression of some religious sentiment, thus — Jacob (supplanter), Isaac (laughter), Isaiah (salvation of Jehovah), etc. The names of women had equal significance: Rachel (ewe), Hannah (favor), Deborah (bee), etc. In Old Testament times the name was often changed on the occasion of an important event in one's life, Abram becoming Abraham, Jacob becoming Israel, and so on. Neither the Hebrews, Egyptians, Assyrians, Babylonians, Persians nor Greeks had surnames; and in the earliest period of their history the same may be said of the Romans. In course of time, however, every Roman citizen had three, the prænomen or personal name, which was placed first, and commonly written with one or two letters, for example C. for Gaius, Cn. for Gneius, M. for Marcus, Q. for Quintus, and so on. Then followed the nomen, the name of the gens or clan, as Cornelius, Julius, Fabius, from the Cornelian, Julian and Fabian gentes. Lastly came the cognomen or family name, as Cicero, Cæsar, Scipio, etc. Conquerors were occasionally complimented by the addition of a fourth name or agnomen, commemorative of their conquests, as Coriolanus, Africanus, Germanicus, etc. While the earliest Greek names were expressive of some quality in high estimation, as Callimachus (excellent fighter), Apollodorus (gift of Apollo), the Roman names were less dignified and ambitious in their origin; thus Porcius (swineherd), Cicero (vetch grower); some from personal peculiarities, as Naso (longnosed), Paulus (little), Crassus (fat), Cocles (one-eyed). Celtic and Teutonic names had often equal significance, as Gottfried (God's peace), Conrad (bold in counsel), Bertha (brightness), Ethel (noble), etc. Times of great public excitement have had a very considerable influence in modifying the fashion in names. Thus the English Puritans preferred Old Testament names and such as directly expressed religious sentiment. Among the Scottish Covenanters Old Testament names were also prevalent. At the French Revolution the names of the most famous Greek and Roman republican heroes were in general favor. Among primitive races, names of familiar objects were first given to clans, local groups, and finally very loosely to individuals.

The principal of the modern system of personal nomenclature now adopted in most countries in Europe is to have one name for the individual (Christian or baptismal name) joined to a second name which is common to the family to which he belongs (surname). It is impossible to state with any degree of certainty when this system became general. No instance is known, we believe, of any Anglo-Saxon family bearing a surname from generation to generation. They were introduced by the Norman adventurers, but were for centuries confined to the upper classes. Surnames became general in Scotland about the 12th century. In some of the wilder districts of Wales they can hardly be said to have been adopted even yet. The principal sources from which surnames are derived are personal characteristics, rank, or profession, localities, animals, or natural objects, and patronymics. Thus from the first source, personal characteristics, we have Black, Brown, Grey, Green, Whyte; Little, Long, Short, Broadhead, Lightfoot, Cruickshank. From rank or profession we have King, Prince, Pope, Bishop, Abbot, Prior, Stewart or Stuart, Smith, Wright, Carpenter, Taylor, Baker or Baxter, Weaver or Webster, Falconer, Fletcher (arrow-maker), Glover, Bowman, Chapman or Marchant, Miller, Brewer or Brewster, Shepherd. From localities, animals or natural objects, come Hill, Dale, Wood, Forest, Brookes or Burns, Grove, Shaw; Bird, Lyon, Hogg, Crabbe, Fox, Roebuck, Bull; Stone, Tree, Flint, Steele. From patronymics are derived Andrews, Anderson, Alexander, Sanderson, Sandison; James, Jameson, Jamieson; Jones, Johnson, Jonson, Jackson; Williams, Williamson, Wills, Wilson; Thom, Thomson; Roberts, Robertson, Robinson. Surnames in many other languages are derived from like sources; thus Black, Whyte, Brown, are with the Germans Schwartz, Weiss, Braun; with the French, Lenoir, Leblanc, Lebrun; the Gaelic prefix Mac, the Irish O', the Norman-French Fitz, the German affix -shon or -son, the Scandinavian -sen, the Russian -vitch, are all equivalents of the English affix -son. The Hebrews, as already stated, had no surnames proper, nor had the Arabians; but to distinguish two men of the same name the former used the form Solomon ben David (Solomon son of David), and the latter Abraham ibn Esra (Abraham son of Esra). The Welsh used the word ap in the same way; Evan ap Richard (John son of Richard). In most nations the wife changes her surname on marriage to that of her husband; in Spain, however, she retains it, while the son may adopt either the paternal or maternal name. In Great Britain a man may now change his Christian name and surname without an act of Parliament, royal license or even public advertisement; but there is no law to compel third parties to use the new name. In the United States names can only be changed by special act of State legislatures.

Nicknames of persons are most difficult to classify owing to the great variety of origins. Physical peculiarities, complimentary (as Strongitharm), derogatory, as Spindleshanks, Sheepshanks, Crookshanks, Heavisides, etc.; mental attributes, as Grave, Stern, Wise, Sage, Moody, Proud, Courteous (Curteis), on one hand, and on the other Blythe, Gay, Foolhardy, Jolly, Meek, etc.; nicknames from complexion and color of the hair, as Black, White, Brown and Browning, Ruddy, Readman, Hoare, Grey, etc.; nicknames from peculiarities of dress, Curtmantel, Shorthose, etc.; from social position, as Bastard, Lacklands and so on; from the animal and vegetable kingdoms, from birds and fishes. Then compounds were made by applying a sobriquet to a Christian name, as Micklejohn, Littlejohn, Brownjohn; if he was a comely, well-made fellow, he was Properjohn. These names appear again in Norman guise, as Grosjean, Petijean, Bonjean, from which comes Bunyan — so that when we speak of good John Bunyan we are (perhaps unconsciously) only translating the name of «the inspired tinker.» See NATIONAL NICKNAMES. Consult Barber, 'British Family Names' (1894); Bardsley, 'Dictionary of English and Welsh Surnames' (1901); Innes, 'Concerning Some Scotch Surnames' (1860); Yonge, 'History of Christian Names' (1863).

NAMOUNA, nä-moo-nä', in Persian mythology, an ever young and beautiful enchantress, born long before any other created thing, yet still retaining all her youthful attractiveness. The idea probably originated in the observation of the changes of nature, the dying of vegetation and its renewal. The same conception has been held concerning the moon for the same reason. Among various American Indian tribes a very similar myth prevailed. The Navajos personified nature in their goddess Estsánatlehi, «the woman who rejuvenates herself.» When she grows to be an old woman she becomes a young girl again. She is always changing but she never dies. She was the mother of the twin war gods by the sun. These sons destroyed the alien gods and bad spirits and aided the sick suffering from witchcraft. The power of her two sons over witchcraft would seem to connect Estsánatlehi with the moon and also with the sun of whom the moon is generally the wife.

NAMUR, nä'moor (Fr. nä-mür'), Belgium; (1) a city, capital of the province of the same name, at the confluence of the Sambre and Meuse, 35 miles southeast of Brussels. The old fortifications have been razed since 1866 with the exception of the picturesque citadel dating from 1784, built upon steep rock, high above the confluence of the rivers. A cordon of five large and four small modern forts now defend the town. The town is beautifully situated and well built, with spacious streets and several handsome squares. Frequent sieges and bombardments destroyed almost all its ancient buildings. Among those of more recent times are the cathedral dedicated to Saint Aubin, one of the most handsome modern churches of Belgium; the church of Saint Loup, the church of Notre Dame, the Hôtel de Ville and the belfry tower. Namur is the seat of a bishop; it possesses a chamber of commerce, a royal athenæum, a public library, a museum, an agricultural society, normal and various other schools and numerous benevolent institutions. Namur is famous for its cutlery, its leather-works and its iron and brass foundries. The trade is greatly favored by the two navigable rivers. Steamers ply on the Meuse; and railways communicate with Brussels, Mons and the French frontier. Namur dates from the 7th century, under the names of Namucum, Navinucum Castrum and Namon. It was taken by Louis XIV in 1692, and retaken by William III of England in 1695. Pop. before the World War, about 33,000. The Germans occupied Namur on 23 Aug. 1914. (2) The province is bounded on the north by Brabant, northeast by Liége, east by Luxembourg, south and southwest by France and west by Hainaut; greatest length, north to south 57 miles; greatest breadth, 37 miles; area, 1,413 square miles. The surface is greatly diversified, well watered by the Meuse, with its tributaries, the Lesse and the Sambre. About one-half of the whole surface is cultivated. The chief vegetable productions are the ordinary cereals, oil-seeds, chicory, fruit and medicinal and dye plants. In some places the vine is cultivated. The extensive forests furnish good timber and the prevailing carboniferous strata yield coal, iron, limestone, etc. The industry of the province, both manufacturing and commercial, is largely developed. Namur was an independent country as early as the 10th century. At the close of the 12th century it came into the possession of the counts of Hainaut, and early in the 13th century fell to Peter of Courtenay, emperor of Constantinople. It was sold by his son Baldwin to Guy of Dampierre, Count of Flanders, with whose descendants it remained till 1420, when it was purchased by Philip the Good, Duke of Burgundy, for 132,000 gold ducats, and afterward shared the fate of the other Burgundian states. Pop. before the war, about 365,000, nearly all of whom speak Walloon. See War, European.

NAN-CHANG-FU, China, the chief town of the province of Kiangsi, 176 miles southeast of Hankow, on the Kan-Kiang, near its entrance into the Po-yang. It is noted for its porcelain industries. Pop. 150,000.

NANA, a novel by Emile Zola, one of the Rougon-Macquart series, which appeared in 1880.

NANA SAHIB, nä'nä sä'hĭb, Mahratta leader of the Sepoy Rebellion: b. near Cawnpore, 1825; d. Nepal, about 1859. His real name was Dhandu Panth, and he was the adopted son of the last Mahratta peshwa of Poona, whose great wealth he inherited, but whose annual pension of about $400,000 was not continued to him by the British government. He lived as a native prince, moving in European society, and when the Sepoy mutiny broke out he secretly encouraged it, but openly offered aid to the English. He marched on Delhi at the head of native troops; promised the English a safe conduct from Cawnpore, but shot or drowned all of them but four; and before leaving the city killed all Europeans, women and children included, that he found in the city and threw their bodies into the famous well of Cawnpore. He fled to Nepal, was repeatedly defeated by the English, who ultimately drove him out of the English province, and was not heard of after 1859. Consult Landon, P., ‘Under the Sun, Impressions of Indian Cities with a Chapter Dealing with the Later Life of Nana Sahib’ (London 1906): Burgess, J., ‘The Chronology of Modern India, 1494–1894’ (Edinburgh 1913).

NANAIMO, na-nī'mō, Canada, a city of British Columbia, on Departure Bay, on the east coast of Vancouver Island, opposite Vancouver on the mainland, with which it has daily steamer service. Its harbor is deep and safe, though often closed by ice in winter. It is connected with Victoria, 73 miles from Victoria by the Esquimault and Nanaimo Railway. The coal mines at Nanaimo and in the vicinity produce more than 1,000,000 tons a year. It exports large quantities of coal, lumber and herring. It also has extensive freestone quarries, large saw-mills and is the centre of a great fruit-growing district. It is the seat of a United States consular agent. Pop. 8,300.

NÂNAK, nä'năk, **NÂNEK,** or **NÂNUK,** Hindu religious leader, founder of the sect of the Sikhs: b. Talwandy (now Nankana), in Lahore, 1496; d. Kirtipur, 1538. A member of the warrior caste, he early associated with Kabir, leader of a monotheistic sect, and came under other mystical influences. He traveled to all the holy places of India, made the pilgrimage to Mecca and Medina, and as a result of his studies of Brahmanism and Islam wrote the ‘Adi-Granth,’ which frequently quotes Kabir, and in general is a mixture of the Vedas and the Koran. This gospel he preached through India; it became the national religion of the Sikhs and was proclaimed by Nânak's successors from Labona down to Govind Sinh, who died in 1708. The ‘Adi-Granth’ preaches the worship of one god, the equality of man, the duty of loving all men and the need for frequent ablution. See Sikhs.

NANCRÈDE, C(harles) B(eylard) Guerard de, American surgeon: b. Philadelphia, Pa., 30 Dec. 1847; d. Ann Arbor, Mich., 13 April 1921. He was educated at the University of Pennsylvania and at Jefferson Medical College; began practice in Philadelphia; and after 1889 was professor of surgery and clinical surgery and surgeon of the university hospital at the University of Michigan, retiring in 1913. In the Spanish-American War he served as surgeon at the front and in 1908–09 was president of the American Surgical Association. He wrote ‘Principles of Surgery’ (1899; 1905); ‘Essentials of Anatomy’ and was a contributor to Wood's ‘Handbook of the Medical Sciences’ (1887); ‘The International Encyclopædia of Surgery’ (1881–95); ‘Cyclopædia of the Diseases of Children’ (1890); ‘Cyclopædia of Diseases of Nose and Throat’ (1893); Dennis' ‘System of Surgery’ (1895); ‘American Practice of Surgery’ (1908), etc.

NANCY (Fr. nŏṅ-sē), France, the capital of ancient Lorraine, of the former department of Meurthe and since 1872 of the department of Meurthe-et-Moselle, situated in a fertile plain, near the left bank of the Meurthe, 218 miles east of Paris, on the railway to Strassburg. It is divided into the old and the new town, has extensive suburbs and is strongly defended by isolated «forts d'arrêt.» The old town is irregularly built, with streets narrow and winding; but has several fine public buildings. The new town has straight and spacious streets, intersecting each other at right angles, and traversed by tramways; the houses, almost without exception, are handsome. The Place Stanislas, surrounded by several fine public buildings, and communicating, by a triumphal arch, with the Place Carrière, has a fine statue of Stanislas Lesczynski, king of Poland, who passed the latter years of his life here as Duke of Lorraine and bestowed upon the town many of its finest modern embellishments. There are statues also to General Drouot, Thiers and other notabilities. The Cours Léopold, occupying the highest part of the town, and finely planted, is the principal promenade; another is the Pépinière, a large planted area. Among the chief edifices are the cathedral, a modern structure in the Italian style; the church of Saint Epvre, with a lofty tower and a fine portal, one of the finest specimens of modern Gothic in France; the church of the Cordeliers, built in 1484, and containing the tombs of several dukes of Lorraine; the 19th century churches of Saint Peter, Saint Vincent and Saint Leon; Hôtel de Ville (17th century); ducal palace, an elegant specimen of flamboyant Gothic, with a fine porch (16th century); public library; seven handsome gates or triumphal arches. Nancy is the see of a bishop and the headquarters of the 20th Army corps. At the head of its educational institutions is the celebrated university founded at Pont-à-Mousson in 1572 and removed to Nancy in 1768; it has faculties of law, philosophy, natural science, mathematics, medicine and a school of pharmacy; Nancy also has a lyceum, a botanical garden, a school of forestry, a theological seminary, etc. The manufactures consist of broadcloth and other woolen stuffs; cotton and cotton yarn, hosiery, lace, all kinds of embroidery, stained paper, tobacco, etc. There are also iron-works, dye-works, breweries and tanneries. In a battle fought under its walls, the Duke of Burgundy (Charles the Bold) was defeated and slain by René II, Duke of Lorraine, in 1477. On 12 Aug. 1870 it surrendered to the Germans, by whom it was occupied until 1 Aug. 1873. The population was largely increased by the influx of Alsatians after the annexation of Alsace to Germany. During the great European War, Nancy was a centre of great military activity. Under the personal command of Kaiser Wilhelm II, who arranged to make a triumphal entry in the ancient Lorraine capital, beginning 6 Jan. 1916 with a bombardment by 15-inch guns at a distance of 16 miles, the Germans unsuccessfully besieged the city for several days. (See WAR, EUROPEAN. Pop. about 120,000.

NANDUS, a Brazilian name for the South American ostrich or rhea. See RHEA.

NÂNEK, or **NÂNUK.** See NANAK.

NANINI, nä-nē'nē, **Giovanni Maria,** Italian composer: b. Vallerano, Italy, about 1540; d. Rome, Italy, 11 March 1607. He studied music in Rome and opened there the first Italian public school of music. He was appointed Maestro di Cappella at Santa Maria Maggiore in 1571. In 1577 he became a member of the Pontifical Choir, and in 1604 maestro of the Sistine Chapel. His compositions are of great value; among them are ‹Hodie nobis Cœlorum Rex›; ‹Cento cinquanta sette Contrappunti e Canoni.› His manuscript works are preserved in the private collections of the Sistine Chapel and the Vatican Library. His published compositions take various forms: motets, madrigals, canzonets as well as Church music. They are of the Palestrina period. Consult Radicotti, G., ‹Giovanni Maria Nanini› (Pesaro 1906).

NANKEEN, or **NANKING CLOTH,** a sort of cotton cloth, which takes its name from the city of Nanking, where it was originally manufactured. It was formerly imported extensively from China, but has generally been superseded by other fabrics. It is now imitated in most other countries where cotton goods are woven. The English manufactures have now so completely driven the Chinese from the market that large quantities are shipped from that country to Canton.

NANKING, nän-kĭng' (officially *Kiangning,* that is, Southern Capital), China, capital of the province of Kiangsu, and vice-regal headquarters for the three provinces of Kiangsu, Kiangsi and Ngan-hui, near the south bank of the Yang-tse-Kiang, 560 miles south by east of Peking. It is 18 miles in circumference and is surrounded by a wall 40 feet high. The principal streets are of moderate width, clean, well paved and lined with handsome stores; but the houses are, in general, mean, and only one story high. The part of the city occupied by the Manchus is separated by a wall from the Chinese town. There are extensive manufactures of fine satin and crape, and the cotton cloth which foreigners call nankeen derives its name from this city; paper and ink of fine quality, and beautiful artificial flowers of pith paper, are produced here. Nanking is celebrated also for its scholars and literary atmosphere, having many large libraries. Nanking was the capital of the Chinese Empire frm 1368 to 1403, but when the seat of government was transferred to Peking it lost its importance and a great part of its population, while about a third of its area is now unoccupied. The only remarkable remains of royalty are the sepulchral Ming statues situated near the walls. The famous porcelain tower of nine stories and 260 feet in height, completed in 1432, was destroyed during the Taiping Rebellion. The city was held from the spring of 1853 to July 1864 by the Taipings, who made it their capital. At its capture bv the rebels and recapture by the Imperialists it suffered severely. By the French treaty of 1858 Nanking was made a treaty port, but never attained any importance as such, owing to the vicinity of Chinkiang-fu. Pop. estimated at 300,000.

NANNA, nän'nä, in Scandinavian mythology, the wife of Balder and the goddess of immaculate purity. Her name means «Blossom» and she was the daughter of Nip, which means «Bud,» and a goddess. In the myth of the ‹Death of Balder the Beautiful,› his wife, Nanna, falls dead by the side of the corpse of her husband and is placed upon the bier with him that she may accompany her beloved even in death. When Hermod visited the land of the dead to gain the freedom of his brother, he found Nanna ministering to him as he lay sick and pale on a couch. Balder wished Hermod to take Nanna back with him; but she refused to leave her husband. Balder is the personification of life-giving light and his wife, Nanna, is the personification of vegetation which dies when the great light giver, the Sun, goes on his winter journey to the south. Balder is generally called the «radiant god of sunshine»; and his wife, like the classical Proserpine, goes down into the underworld.

NANNACUS, or **NANNAKOS,** according to a Greek legend, the king who predicted Deucalion's flood.

NANNING, China, city in the province Kwangsi on the Yu-Kiang River, the chief southern tributary of the Si-Kiang. It is surrounded by a strong wall and lies in a plain enclosed by hills. Before the Taiping revolution the place was of much greater importance but still has a considerable trade in opium and metals carried on with Canton, Yünnan, etc. It has a population estimated at about 40,000.

NANSEN, Fridtjof, frĕt'yŏf năn'sĕn, Norwegian Arctic explorer: b. Great Fröen, near Christiania, 10 Oct. 1861. He studied at Christiania University and in 1882 made an Arctic voyage in a sealing vessel in order to have opportunities of studying animal life in the higher latitudes. On his return he was appointed curator of the Bergen Natural History Museum. In 1888 he crossed Greenland from sea to sea a little north of latitude 64°, an account of this journey being published in England in 1890, under the title ‹Across Greenland.› He returned in 1889 and was appointed curator of the Museum of Comparative Anatomy in Christiania University. In 1893 he sailed on board a specially built steamer (the *Fram*) in the expectation that, entering the Polar ice in the neighborhood of the New Siberian Islands, he would be drifted by a current over the Pole and would come out on the east side of Greenland. This expectation was based on the fact that articles belonging to the *Jeannette,* an Arctic expedition vessel lost in 1881, had drifted in about three years from Bering Strait across the Polar regions to Greenland. After being carried to lat. 83° 59', he left the *Fram* and crew, and with a single companion, Lieutenant Johansen, and with sledges, dogs and kayaks, took the ice. In this way he reached a higher latitude than any previously attained, 86° 14' (8 April 1895), and then turned southwestward to Franz Josef Land. There he spent the winter of 1895–96, and on 17 June 1896 fell in with members of the Jackson-Harmsworth expedition, with which he returned to Vardë. The *Fram,* under Captain Sverdrup, had reached lat. 85° 57', and had been for four months fast in the ice. Nansen was received everywhere with the greatest enthusiasm and medals and other honors were conferred upon him, including a professorship of zoology in Christiania University. In 1897 he published an account of his voyage, which appeared in English as ‹Farthest North,› the most interesting of all narratives of Arctic travel. A translation of a work by him on ‹Eskimo Life› was published in 1893. His further works include ‹Northern Mists› (1911); and ‹Through Siberia› (1914). He was strongly favorable to the separation of Norway from Sweden (on which he wrote a volume) and was Minister for Norway at London 1906–08. In 1906 the Grand Cross of the Victorian Order was conferred on him. On his return to Norway he became professor of oceanography at Christiania University. Consult Dolman, F., ‹Dr. Nansen: the Man and His Work›; Brögger, W. C., and Rolfsen, N., ‹Fridtjof Nansen› (London 1861–92; trans. by Archer, ib. 1906).

NANSEN, Hans, Danish statesman: b. Flensburg, 28 Nov. 1598; d. Copenhagen, 12 Nov. 1667. He entered (1621) the service of the Danish Icelandic Company and made many trading voyages to Iceland. In 1644 he was made burgomaster of Copenhagen, and from 1658–60, during the storm and stress period, his city's trust in his abilities enabled him to obtain from Frederick III the anti-aristocratic reform of 1660. The resulting absolute monarchy is said to have been contrary to his wishes, but he retained his honors, going largely into commercial life and omitting politics. Consult Nielson, Oluf, ‹Kjöbenhavns Historie› (Vol. III, Copenhagen 1877).

NANTERRE, năn'tăr, France, town in the department of Seine and arrondissement of Saint-Denis, located at the foot of Mount Valérien and on the West Railway, a few miles from Paris. Its chief industry is the manufacture of chemicals. This is the traditional birthplace of Saint Genevieve and the Revolution hero Henriot was born here. Pop. 21,350.

NANTES, nănts (Fr. näṅt), France, capital of the department of Loire-Inférieure, and an important commercial port, on the right bank of the Loire, where its receives both the Erdre and the Sèvre, 248 miles by rail west-southwest of Paris. The Loire here forms a number of islands, two of which are among the finest quarters of the town, and are connected by several bridges. The situation, on an important navigable river, within 40 miles of the ocean, is advantageous for commerce and has been enhanced since 1891 by the construction of a ship-canal to Saint Nazaire, at the mouth of the Loire, and by considerable expenditure in harbor improvements since 1914. Nantes is so well placed and so regularly, and in some parts so splendidly built, that it justly ranks as one of the finest towns in France. It has a number of elegant squares; and its quays, which line the banks of the rivers, extend nearly five miles. The notable public edifices are the cathedral, in the flamboyant style, dating from the 15th century; the handsome modern church of Saint Nicholas in the Gothic style of the 13th century, with a tower 278 feet high; the celebrated ducal castle, an edifice of the 14th century, partly modernized in the 16th, flanked with massive round towers; the palace of justice or law courts, a large and handsome building; the Hôtel de Ville; the exchange, restored and enlarged in 1891; the museum of natural history; and the new museum (1897); the large picture gallery; public library of 102,000 volumes; chapter-house, and Hôtel Dieu or infirmary. Nantes is the see of a bishop; it has courts of first resort and commerce, a chamber of commerce and exchange, a college, diocesan seminary and secondary ecclesiastical school; a secondary school of medicine and a hydrographical school of the first class. The manufactures consist of blankets, serge, flannel, printed stuffs, canvas, ships' boilers and machinery, cordage, chemical products, glue, ship biscuits, etc.; there are also cotton mills, sugar refineries, iron works, glass works, bleach fields. Sardines and preserved meats are important articles among its industrial products. The ship-building docks are of great extent. Nantes carries on a large foreign trade, vessels of 1,700 tons being able to reach the town. The trade includes a variety of articles both for the home, the colonial and the foreign markets. Before the conquest of Gaul by the Romans, Nantes was the capital of the Nannetes. In 1445 it valiantly withstood a siege of 60 days by the Huns. During the 9th century it was thrice taken by the Normans and almost entirely ruined. In 1118, when it had again become prosperous, an accidental fire reduced the greater part of it to ashes. During the English wars in France it suffered much, repeatedly falling into the hands of opposite parties. For a long time it formed one of the most valuable possessions of the dukes of Brittany, but in 1499 the heiress of the dukedom, Anne of Brittany, who was born here, having married Louis XII, it passed with the rest of her possessions to the Crown of France. The most memorable event connected with the history of Nantes is the famous edict (see EDICT OF NANTES) issued by Henry IV, 30 April 1598, securing the Protestants in the free exercise of their religion, and making them eligible to all civil and military employments. This edict was revoked by Louis XIV in 1685. The *noyades* or drownings of the monster Carrier during the Revolution were perpetrated here. (See CARRIER). Pop. about 171,000.

NANTES, Edict of. See EDICT OF NANTES.

NANTEUIL, Robert, nän'tē'y, French copperplate engraver: b. Rheims, 1630; d. Paris, 1678. His father-in-law, Nicolas Regnesson, was his first instructor and in 1647 he went to Paris and worked under the eye of Philippe de Champagne (q.v.). Louis XIV appointed him designer and engraver to the king. He employed in his work a simple line which grew gradually thicker at the shade point and died away toward the high light in faint and fainter stipple points; in this way he produced the fine color values which characterize his engravings. In his portraits, of which about 200 exist, he exhibits powerful modeling and life-like drawing. They include portraits of Louis XIV, Anne of Austria, Madame de Sévigné and other renowned persons. Some of these latter works are after the paintings of Lebrun, Du Chastel and others. He also executed some excellent pastels. Consult Loriquet, ‹Robert Nanteuil› (1886); Metcalfe, ‹Prints and Their Makers› (New York 1912).

NANTICOKE, năn'tĭ-kōk (Nentigo, «tidewater people»), a former American Indian tribe of the Algonquian family residing, when first discovered by the whites, on the east shore of the Nanticoke River, where according to Smith their principal village, also called Nanticoke, was situated in 1608. Their language was very closely related to that of the Delaware. They were great fishers, trappers and hunters and according to tradition they had, at an earlier period in their history, gone southward in search of game, when their old hunting grounds had become too densely populated for a nomadic race. Tradition also says that a league existed between the Nanticoke and other tribes covering a large extent of territory, for many generations. Already in 1642 the Nanticoke had been declared enemies of the Maryland colony; but in 1678 a treaty was made with them; and 20 years later reservations were set apart for them. About 1725 they began to move northward gradually, going up the Susquehanna and finally settling at Oswego, Chenango and Chugnut in the State of New York. A part of the tribe, however, under the name of Wiwash, remained behind in Maryland. Some of those in New York State amalgamated with the Iroquois; but most of them, feeling the pressure of civilization, went west into Ohio and Indiana and there joined the Delawares about 1784.

Among all the neighboring tribes the Nanticoke Indians had the reputation of being great magicians; and they were greatly feared on this account. A head chief ruled over all the villages, thus binding together the interests of the tribe or tribes composing the Nanticoke people. Apparently this chief was sometimes a woman. They fortified their towns against the enemy. In the «Nanticoke Confederacy» were included the Nanticoke proper, Arseek, Cuscarawaoc, Nause and Sarapinagh and perhaps Ozinies and other sub-tribes. In southern Delaware there are still numerous half-breed Nanticoke.

NANTICOKE, Pa., borough in Luzerne County, on the Susquehanna River and on the Delaware, Lackawanna and Western, the Central of New Jersey and the Pennsylvania railroads, about 80 miles north by east of Harrisburg. The town of Nanticoke was surveyed, plotted and streets laid out in 1793. It is situated in an anthracite coal region in Hanover and Newport township, and has extensive water power which is utilized in manufacturing. The industry contributing most to the wealth of the town is coal mining. This is the greatest coal deposit and the richest mining district in the world. The chief manufacturing establishments of the city are mining and agricultural implement works, large hosiery mills, knitting factories, canning factory, flour and grist mills, lumber mills, silk mills and cigar factories. It has considerable trade in coal and its own manufactures. There is an excellent school system with 12 modern school buildings. The government is administered under the original charter which provides for a burgess, who holds office three years, and a council. Pop. (1920) 22,614.

NANTUCKET, Mass., town, county-seat of Nantucket County, embracing the islands of Nantucket, Tuckermuck and Muskeget. It is about 25 miles from the mainland of the State and 100 miles southeast of Boston. On the north is Nantucket Sound, on the east and south the Atlantic Ocean and on the west Muskeget Channel, which separates it from Martha's Vineyard. The main island, Nantucket, is about 15 miles long, and averages about two miles in width. The area of the whole town is about 60 square miles. The most populous part of the town is along the north shore of the largest island. There are several villages in the town; the largest, Nantucket, on Nantucket harbor, was founded in 1673. The first settlement was made in 1659 by a colony in charge of Thomas Macy, at the place called Madeget. Nantucket is a famous summer resort; the island is dotted with handsome summer villas. The residents claim that the climate is antagonistic to asthma, hay fever and malaria. At one time Nantucket was the headquarters of a great whaling industry, but the chief industries of the present are agriculture and fishing. A flourishing coastwise trade is carried on by a number of the islanders. Muskeget Park is one of the attractions. The town has a public library (the Athenæum), and the Coffin High School. At the «town meeting» the administrative officials are annually elected. Pop. 2,797. Consult Hinchman, ‹Early Settlers of Nantucket›; Worth, H. B., ‹Nantucket Lands and Landowners› (Nantucket 1901–10); Duglas-Lithgow, ‹Nantucket› (New York 1914).

NANTYGLO (năn'tĭ-glō) **AND BLAINA,** blā'nạ, England, town in Monmouthshire near

Abergavenny. Its importance lies in its large coal-mining and iron industry. Pop. 15,395.

NAON, nä-ōn', **Rómulo S.**, Argentine diplomat: b. Buenos Aires, 17 Feb. 1875. He studied at the University of Buenos Aires and later became professor of philosophy at the Colegio Nacional de Buenos Aires, then professor of constitutional law and member of the directive council faculty of law and social sciences. He entered political life (1902) as representative of the National Congress and was re-elected (1906), becoming Minister of Justice and Public Instruction (1908). He was (1911–14) Envoy Extraordinary and Minister Plenipotentiary to the United States and in the latter year became the first Ambassador of Argentina to the United States. He was re-elected (1912) to the National Congress but resigned to remain with the United States. In 1917 he resigned his office because his country's government refused to declare war against Germany. He served as general secretary of the Argentina delegation to the second Hague Peace Conference, was a member of the A. B. C. (Argentine-Brazil-Chile) Peace Conference (1914) at Niagara Falls, to avoid war between the United States and Mexico, a delegate at the Pan-American Conference (1915). For his valuable services he has received numerous decorations. He has written several works on political science and constitutional law, and has received, among other diplomas, that of LL.D. from the universities of Pittsburgh, Yale, Harvard and Brown.

NAOROJI, now'rō-jē, **Dadabhai**, first Indian member of the British Parliament: b. Bombay, 4 Sept. 1825; d. 2 July 1917. The son of a Parsi priest, he was educated in the Bombay school, later the Elphinstone School and College, where he was the first native professor of mathematics and natural philosophy (1854). In 1855 he went to England, where he afterwards, for the most part, resided. In 1867 he assisted in founding the East India Association; through his efforts in 1870 the civil service was opened to native Indians; and he accomplished much for the improvement of Indian finance and industries. He became Prime Minister to the Prince of Baroda in 1874; from 1875 to 1887 he held important municipal and legislative positions; and in 1886 and 1893 was president of the Indian National Congress. For many years he was president of the London Indian Society. From 1892 to 1895, as a Liberal, he represented Central Finsbury in the House of Commons, and in the latter year was made a member of the royal commission formed to inquire into Indian expenditure, etc. He published 'England's Duties to India' (1867); 'The Wants and Means of India' (1870); articles collected in 1887; 'Poverty and Un-British Rule in India' (1901), and 'The Rights of Labour' (1906).

NAPA, nä'pä, Cal., city, county-seat of Napa County, on the Napa River and on the Southern Pacific Railroad. It is in an agricultural region in which large quantities of fruit are raised, and in the vicinity is an extensive deposit of cement rock. It was settled in 1847 and in 1863 was incorporated. The city has excellent transportation facilities as the Napa River is navigable, thus making direct water communication with San Francisco and other cities. The chief manufactures are gloves, leather and shoes. There is a large trade in fruit, Portland cement (made at Napa Junction), and the manufactures of the city. The scenery around Napa is beautiful; some of the attractions are the petrified forests, the mineral springs and the Napa Redwoods. It has the State Hospital for the Insane. Pop. 6,757.

NAPANEE, Canada, a port of entry and the county-seat of the united counties of Lennox, Addington and Ontario, 24 miles west of Kingston, on the Bay of Quinté, about seven miles from the mouth of the Napanee River. It is the terminus of the Quinté and Napanee Railroad and is on the Grand Trunk and Canadian Northern railroads. It has flour-mills, factories, brick and tile works, motor boat and carriage works, and is the centre of a rich agricultural district. Pop. (1921) 3,018.

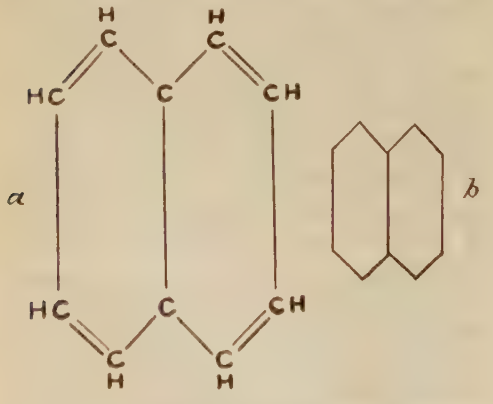
NAPERVILLE, na'pėr-vĭl, Ill., city in Du Page County, on the Du Page River and on the Chicago, Burlington and Quincy Railroad, about 28 miles west of Chicago. It was settled in 1830 and in 1857 was incorporated. It is in an agricultural region. It is chiefly a residential city, the seat of the Northwestern College, established in 1861 under the auspices of the Evangelical Association. It has good public and parochial schools, the Nichols Library, a theological seminary, Y. M. C. A. building, the Edward Tubercular Sanatorium, Saint Procopius Bohemian College, a convent and orphanage. The city's manufactures include couches and davenports, flynetting, gloves, ice, butter, ice-cream, etc. There are two large nurseries also in the city, which is under the commission form of government. Pop. 3,830.

NAPHTALI, năf'ta-lī (Hebrew, «wrestler»), the seventh son of Jacob by Bilhah, Rachel's maid, one of the 12 patriarchs and eponymous founder of one of the 12 tribes of Israel. The territory of Naphtali lay to the northwest of the Sea of Galilee; of this tribe was Barak, the hero and deliverer of Israel in the days when Deborah, the wife of Lapidoth, judged Israel. This frontier tribe was exposed to the incursions of the adjoining heathen, and is specially mentioned in the Song of Deborah as among those who «jeopardized their lives under the death» in the battle against Jabin the Canaanite king. Tiglathpileser when he overran the north of Palestine carried off the whole population to Assyria, after which Naphtali disappears from history. The district became famous under the name of Galilee as the home of Jesus Christ and most of his apostles. Capernaum, Tiberias, Magdala and Chorazin lay within the ancient boundaries of the tribe of Naphtali.

NAPHTHA, in the commercial sense a product of the fractionation of crude petroleum, obtained by the redistillation of benzine, being the heavier constituent after the benzoline has distilled over. It is also called «mineral naphtha.» Another commercial article is «solvent naphtha,» a somewhat similar liquid obtained in the fractionation of coal-tar, distilling over between the temperatures of 250° and 330° F. In the chemistry of the ancients the term included all inflammable liquids, especially the more fluid sorts of asphalt or bitumen; the word which is of Persian origin and signifies «moist» being first used of the Persian product and then applied more generally. In modern usage and among chemists the term is applied to any volatile inflammable liquid product of organic decomposition, as the distillation products from peat, wood, india-rubber, bones, etc. These vary in density from 0.67 to 0.72, and in gravity from 90° to 60° Beaumé. American petroleum naphtha constitutes from 6 to 20 per cent of the crude petroleum. Russian petroleum is only 5 or 6 per cent naphtha. Scotland produces a naphtha called shale-spirit, being 4 or 5 per cent of the crude shale oil, and rather heavier than most other naphthas, but not so heavy as the coal-tar naphthas, which vary in specific gravity between .850 and .950. Caoutchine is another name for india-rubber naphtha. The uses of naphtha are various, the lighter grades being utilized as detergents in the cleansing processes preparatory to dyeing, and in the dry cleaning of clothes and gloves. The coal-tar naphthas are largely employed as solvents in making india-rubber goods. The Scotch shale-spirit is the liquid component of a wood preservative. Naphtha is also used very largely as a solvent in the extraction of oils from oil seeds, and of essential oils in the manufacture of perfumes and essences.

NAPHTHA-POISONING. While the vapors, and even the ingestion of naphtha in small quantities, have not been found poisonous to human beings, the fumes resulting from the burning of naphtha are deadly if in admixture with the air in a confined place. This poisoning effect is due to the large proportion of carbon monoxide — about 7 per cent — contained in the residual gases. A proportion of one-tenth of 1 per cent in the air renders it dangerous to the majority of persons. A considerable number of fatal accidents have been caused by breathing the exhaust gases from a gasoline-burning automobile in the restricted space of a small garage. See PETROLEUM-POISONING.

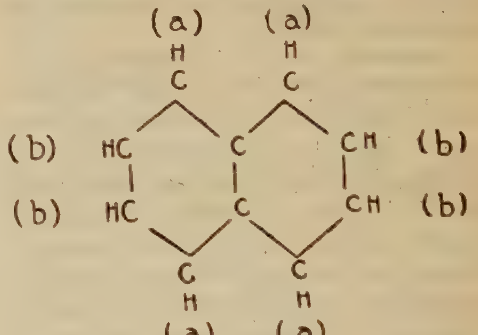
NAPHTHALENE, or NAPHTHALIN, a coal-tar product consisting of carbon and hydrogen, with the chemical composition $C_{10}H_8$ and a certain chemical similarity to benzene.



Its peculiar chemical composition may be represented by the graphic formula known as the condensed benzine rings, as below. These are generally written without the letter symbols, as at b.

Naphthalene is prepared from the middle or «carbolic» oil obtained in the distillation of coal-tar between the boiling point temperatures of 410° and 460° F. The naphthaline crystallizes out on cooling, is then centrifugalized, pressed, warmed, stirred with caustic soda and, after the addition of sulphuric acid and several washings with hot water, is either sublimated or distilled. Physically, naphthalene is a white solid, with brilliant, leafy crystals, melting at 175° F. to a colorless liquid, which boils at 425° F. It burns with a sooty flame and pitchy odor. It is insoluble in cold water, slightly soluble in water at a higher temperature and easily soluble in the essences, in boiling alcohol or in ether. Naphthalene forms a multitude of various compounds, mostly by simple addition; the most important are the various sulphonic acids, such as $C_{10}H_7SO_3H + H_2O$, used in the manufacture of dyes. The nitro-derivatives of naphthalene are also extensively used as intermediates in dye-making. Under the popular name of «moth balls» or «coal-tar camphor,» naphthalene is used to keep moths and other insects from clothes. It vaporizes slowly with no residue, and is useful to some extent as a disinfectant and deodorizer. Consult Tinkler, C. K., and Challenger, F., 'The Chemistry of Petroleum and Its Substitutes,' (New York 1915).

NAPHTHOL, in chemistry, a substance derived from naphthalene in the same way that phenol is derived from benzene — that is, by replacing one of the hydrogen atoms of the hydrocarbon by a molecule of hydroxyl, OH. Its chemical name is hydroxynaphthalene. The empirical formula for naphthalene being $C_{10}H_8$, the corresponding formula for naphthol therefore is $C_{10}H_7.OH$. In benzene the substitution can be made in only one way, because the molecule of that substance is chemically symmetrical, its hydrogen atoms being all similarly related to one another, and to the carbon atoms. In naphthalene, however, two essentially different kinds of substitution are possible, according to the position of the hydrogen atom that is replaced. This will be understood by reference to the structural formula of naphthalene, as presented herewith. The hydrogen atoms in the positions marked «a» are more directly associated with the central pair of carbon atoms than are those in the positions marked «b»; and we must therefore admit that two chemically different naphthols are possible, according as the hydrogen that is replaced by hydroxyl is an «a» atom or a «b» atom. These two naphthols are in fact known, and to distinguish them from each other the prefixes



«alpha» and «beta» are attached to the name. Thus «alpha-naphthol» is the compound obtained by replacing one of the «a» hydrogen atoms by OH, and «beta-naphthol» is the compound obtained by a similar replacement of a «b» atom. Both of the naphthols resemble ordinary phenol (or carbolic acid), and both are used as antiseptics and also in the preparation of certain of the coal-tar colors. The naphthols exist in coal-tar in very small quantities in the fractions made at a high boiling point and may also be prepared by the action of fuming sulphuric acid upon naphthalene, followed by treatment with sodium hydroxide. In the making of a naphthol the sulphuric acid treatment is conducted at a temperature ranging from 175° to 190° F. For B-naphthol the temperature is kept at 390° F. Alpha-naphthol crystallizes in short lustrous monoclinic needles, which melt at 201° F. and boil at 543° F. Beta-naphthol crystallizes in flat plates or tablets, melts at 253° F. and boils at 547° F. Both are slightly soluble in hot water, and both dissolve freely in alcohol, ether and benzene. The solution of A-naphthol in water has a violet color; that of B-naphthol a yellow color. The naphthol derivatives of most value in the arts are their sulphonic acids, and di-sulphonic acids, and the tri-sulphonic acid of A-naphthol, and chromotrope acid or chromogen; all used in the production of coal-tar dyes.

NAPHTHYL, a hyrocarbon radical $C_{10}H_7$, occurring in the compounds and derivatives of naphthalene. It is a merely hypothetical group as it appears only in compounds. If its existence be assumed, naphthalene ($C_{10}H_8$, or $C_{10}H_7.H$) is merely its hydride; naphthol or naphthyl alcohol in the same way might be considered a hydrate of naphthyl, since its formula may be written $C_{10}H_7OH$. Dinaphthyl ($C_{20}H_{14}$) is a carbide formed by the action of heat upon naphthalene; it is a solid and is fusible at 154° C.

NAPIER, nā′pĭ-ẽr, Sir **Charles,** British naval commander, cousin of Sir Charles James and Sir William Napier (q.v.): b. Merchiston Hall, Stirlingshire, 6 March 1786; d. Merchiston Hall, Hampshire, 6 Nov. 1860. At 13 he entered the navy as a volunteer and in 1805 was promoted lieutenant. In 1807 he became commander, and from the gallantry he displayed in the pursuit of three French line-of-battle ships in 1809 was shortly after made post-captain. He was then put on halfpay and joined the British army in Portugal where he took part in the battle of Busaco. In 1814 he was dispatched to the United States, and led an expedition against Baltimore. In 1827 he received the command of the *Galatea,* in which he was employed on the coast of Portugal and the Azores. Becoming acquainted with the Duke of Terceira and other Constitutionalists, he accepted the command of their fleet, and by his defeat of the Miguelites in a naval engagement effected the relief of Oporto and the establishment of Donna Maria on the throne. For his services the Portuguese government created him Count Cape Saint Vincent and nominated him admiral-in-chief. He soon returned to England and in 1839 was ordered to the Mediterranean, where, upon the outbreak of the war between Mehemet Ali and the Porte, and the co-operation of Britain with Russia and Austria on behalf of the latter power, he performed some of his most gallant exploits, including the storming of Sidon and the capture of Acre. Having blockaded Alexandria, he concluded on his own responsibility a convention with Mehemet Ali, by which the latter and his family were guaranteed in the hereditary sovereignty of Egypt on resigning all claim to Syria. In 1841 he was elected member of Parliament for Marylebone, and proved himself a warm advocate of liberal measures and naval reform. In 1847, while in command of the Channel fleet, he compelled the emperor of Morocco to grant compensation for the injuries inflicted by him on British commerce. On the commencement of the Crimean War he was nominated to the command of the Baltic fleet, but in this capacity had few opportunities for striking a decisive blow, which at the time somewhat disappointed his country. Sir Charles Napier was an author as well as a commander and published ‹The War in Portugal› (1836); ‹The War in Syria› (1842); ‹The Navy, its Past and Present State› (1851). Consult Elers Napier, ‹Life and Correspondence of Admiral Sir Charles Napier› (1862); Williams, H. N., ‹The Life and Letters of Admiral Sir Charles Napier, K.C.B.› (London 1918).

NAPIER, Sir **Charles James,** English soldier and administrator: b. London, 10 Aug. 1782; d. Oaklands, near Portsmouth, Hampshire, 29 Aug. 1853. He entered the army as ensign in his 12th year and within four months was gazetted lieutenant. Having become captain in 1803, he accompanied his regiment to the Peninsula and distinguished himself at Coruña, where he had the rank of major, and where, after receiving five wounds, he was taken prisoner. In 1810 he returned to the Peninsula and fought at Busaco. After obtaining the rank of colonel and taking part in most of the leading events of the Peninsular campaigns, he returned to England on the conclusion of peace. He was in the United States during the War of 1812, and after his return took part in the storming of Cambrai in 1815. From 1822 to 1830 he was governor of the island of Cephalonia, where he pleased the inhabitants better than the authorities at home. In 1841 he sailed for the East to assume the chief military command within the presidency of Bombay. He was shortly afterward called to Sind in consequence of the determination of Lord Ellenborough, then governor-general, to punish the ameers for alleged misconduct during the Afghan war. This policy was ably carried out by Napier, first by the splendid victories of Meanee (17 Feb. 1843) and Hyderabad (24 March) and afterward by the administration of Sind as a conquered province, of which Lord Ellenborough made him governor. He retired in 1841, but during the Sikh war of 1848–49 he sailed once more for the East as commander-in-chief of all the forces in India. Having taken a step which subjected him to an unceremonious rebuke from the Marquis of Dalhousie, the governor-general, he resigned and returned to England the next year. Consult Bruce, ‹Life of General Sir Charles Napier› (1885); Butler, ‹Sir Charles Napier› (1890).

NAPIER, John, Scottish mathematician: b. Merchiston, near Edinburgh, 1550; d. there, 4 April 1617. He was educated at Saint Andrews, traveled in Europe, returned to a life of proprietorship and leisurely study, and published in 1593 his 'Plaine Discovery of the Whole Revelation of Saint John,' which was an original work, without a predecessor in its line. For a time he busied himself with devising instruments of war, such as burning-glasses for firing hostile vessels; a piece of artillery for destroying everything round the arc of a circle; and a round metal chariot, from which shot might be fired through small openings while the enemy became «abased and altogether uncertain.» Sir Thomas Urquhart ('The Jewel,' 1652) says that the artillery was tried on a Scottish plain with the slaughter of many sheep and cattle. His great work, 'Mirifici Logarithmorum Canonis Descriptio,' appeared in 1614. This explained the nature of logarithms (q.v.), then styled «artificial numbers,» and supplied the table for their application. It astonished Europe and deeply interested Kepler, who helped to extend the use of logarithms. With Henry Briggs, Napier devised the new canon in which 0 represented the logarithm of unity and 10,000,000,000 that of the entire sine. His 'Mirifici Logarithmorum Canonis Constructio' (1619) explained the method of constructing the table; and the 'Rabdologia' (1617) was a description of enumeration by bone or ivory rods, which, known as «Napier's rods,» were widely employed in Europe for assistance in multiplication, division and the extraction of the square and cube root. Consult Napier, Mark, 'Memoirs' (1834).

NAPIER, Robert Cornelis, Lord Napier of Magdala, English soldier: b. Ceylon, 6 Dec. 1810; d. London, 14 Jan. 1890. Educated at the Military College, Addiscombe, he entered the Bengal Engineers, and during the second Sikh war (1848) was present as chief engineer at the siege of Multan, and after its fall took part in the battle of Gujarat. When the Mutiny broke out in 1857 he was appointed chief of the staff to Sir James Outram, and in the second relief of Lucknow he constructed the engineering works which enabled Sir Colin Campbell to capture the city. In the Chinese campaign of 1860 he was second in command, and in 1865 became commander-in-chief of the Bombay army. He commanded in 1868 the expeditionary force against King Theodore of Abyssinia, defeated the king's forces, released the English prisoners and stormed the mountain fortress of Magdala (April 1868). For his services in this short but brilliant campaign he was rewarded with a peerage and a pension. Subsequently he was appointed commander-in-chief in India (1870), governor of Gibraltar (1876) and constable of the Tower (1887). At his death he was buried in Saint Paul's with military honors. Consult Markham, 'History of the Abyssinian Expedition' (1869), and Escott, 'Pillars of the Empire' (1879).

NAPIER, Sir William Francis Patrick, British soldier and author, brother of Sir Charles James Napier (q.v.): b. Kildare, Ireland, 17 Dec. 1785; d. Scinde House, Clapham, Surrey, 12 Feb. 1860. At 14 he entered the army with his brothers Charles and George, took a distinguished part in the Peninsular campaigns, receiving seven decorations for the share borne by him in as many principal actions, including Busaco, Salamanca, the Nivelle and Orthez. Some years later he began his celebrated 'History of the Peninsular War' (6 vols., 1828–40). It furnishes the best and most interesting record existing of the momentous transactions which it chronicles, though from its opposition to the prevailing politics of the day its merits were at first insufficiently appreciated. In 1841 he was advanced to the rank of major-general, was appointed lieutenant-governor of Guernsey the following year and in 1848 created a K.C.B. Criticisms on his brother's proceedings in India called him forth as his champion, and produced successively the 'Conquest of Scinde' (1845); 'History of Sir Charles Napier's Administration of Scinde' (1851); and 'Life and Opinions of the Late Sir Charles Napier' (1857). He also wrote 'English Battles and Sieges in the Peninsula.' Consult 'Life' by Lord Aberdare (1864).

NAPIER OF MAGDALA. See Napier, Robert Cornelis.

NAPIER. The chief town and port of the district of Hawke's Hill, east coast of North Island, New Zealand. It is the centre of a large district of squatters and is rather wealthy for its size. Being a peninsula, it has excellent harbors. Its bay ranks with that of Naples for picturesqueness. The exports are wool and frozen meats. The town has freezing plants and a number of other prosperous industries. Its exports were recently valued at £1,532,422; the imports at £467,837. Napier is a famous winter resort.

NAPIER'S RODS, *in mathematics,* a set of rods contrived by John Napier in 1617 for the purpose of facilitating the numerical operations of multiplication and division.

NAPLES, nā'plz, Italy, the capital of the province of Naples, and previously of the former kingdom of the Two Sicilies (q.v.), the largest city and most important seaport of the kingdom, situated on the celebrated Bay of Naples, 150 miles by rail southeast of Rome. Its site is of singular beauty, occupying an area about five miles long and three miles broad, on the north side of the nearly semi-circular bay, partly along the shore and partly climbing the adjacent slopes. It is bounded on the one side by the picturesque heights of Posilipo and on the other by the lofty, volcanic mass of Vesuvius (q.v.). The environs are densely peopled, among neighboring towns and villages being Portici, Resina, Castellamare, Casoria, Pozzuoli, etc., and the classic sites of Herculaneum and Pompeii (qq.v.), all connected by rail. The bay, 20 miles wide, and extending inward 10 miles, with a coast line of about 35 miles, has Cape Miseno as its northwest extremity, off which lie the islets of Procida and Ischia; Campanella Point forms the southeast extremity, with the beautiful isle of Capri lying beyond. The city is divided into two unequal parts by a steep ridge projecting from the height on which stands the castle of Saint Elmo, and terminated by a rocky islet surmounted by the Castello dell' Ovo. The largest and most ancient part of Naples lies to the east of these heights. This now forms the business quarter and is intersected from north to south by the main street, the Via di Roma. The western and more modern part of the city, the fashionable quarter, has a superior situation, and commands magnificent views; the chief street in this quarter is the Corso Vittorio Emanuele, nearly three miles long. The streets are mostly well paved with lava or volcanic basalt, and the houses are large, lofty and solidly built, and have flat roofs. Since the cholera epidemic of 1884 a plan of municipal improvement on an extensive scale has been carried out, including a new water supply, a modern sewerage system, the destruction of the narrow streets, alleys and lanes, the former abodes of filth, misery, vice and crime, and the building of new quarters, with wide thoroughfares and modern houses. There are few remains of ancient times, but there are five castles, dell' Ovo, Nuovo del Carmine, Capuano, Saint Elmo, the gates Porta del Carmine and Capuano, all of mediæval construction, and Virgil's tomb.

Among the chief public edifices is the cathedral, dating from 1272, a large Gothic building erected on the site of two temples dedicated to Neptune and Apollo. It is held in high veneration in consequence of possessing the relics of Saint Januarius or Gennaro, including the phial of his blood which liquefies periodically in a miraculous manner. Other edifices are the church De' Santi Apostoli, said to have been originally founded by Constantine the Great on the site of a temple of Mercury; the church of Saint Paul, built in 1817–31 in imitation of the Pantheon at Rome; the Palazzo Reale (Royal Palace), a building of great size in the lower part of the town; the palace of Capo di Monte, situated on a height in the outskirts; the old palace, where the courts of justice now hold their sittings; the Galleria Umberto I; the Palazzo dei Pubblici Studi, formerly occupied by the university, but now converted into the Museo Nazionale, a museum containing not only a valuable library of over 600,000 volumes and pamphlets and many rare manuscripts, but also the older and more recent collections belonging to the Crown, the Farnese collection of paintings and sculpture from Rome and Parma, and an unequaled collection of gems, bronzes, vases, etc., chiefly obtained from the excavations of Pompeii and Herculaneum. Naples has a university, dating from 1224, and attended by over 5,000 students; many other educational institutions, including the celebrated zoological station with marine aquarium and laboratory, and numerous hospitals and charitable foundations. It is the see of an archbishop and an important naval and military station, with an arsenal and gun works. The manufactures include steel and engine works, woolens and cottons, silk known as *gros de Naples,* glass, china, soap, chemicals and macaroni, their products being largely exported, other exports being gloves, perfumery, artificial flowers, paper, olive oil, wines and fruits. The imports include manufactured goods, Colonial produce, iron, coal and cotton yarns. The harbor affords magnificent anchorage, the depth at the end of the mole being 65 feet and at the arsenal 26 feet. In 1915 8,913 ships entered; total tonnage, 7,603,106 tons. Naples is an important point for transatlantic emigrants.

Naples is one of the most densely populated cities of Europe, and one of the features of the city is its unique population, which swarms incessantly in the thoroughfares, where throngs of sellers, buyers and idlers intermingle with asses, mules, hand carts and vehicles, dazzling the eye with their brilliant variety of costume, and the expressiveness of their frantic gestures and attitudes, while the ear is stunned by the shrill cries of the itinerant dealers, the songs of the improvisatore and the high-pitched patois of the seething crowds. The Marinella, an open beach fronting the east part of the city, was formerly the abode of the lazzaroni, a class which has now lost its distinctive features, the term being now generally applied to the fishermen.

Naples was founded by a Greek colony from the town of Cumæ many centuries before Christ. It took the name of Neapolis («New City») to distinguish it from a still older Greek city adjoining called Parthenope. It passed to the Romans in 290 B.C. In 536 A.D. it was taken by Belisarius, and was pillaged by Totila in 542. In 1130 the Norman Robert Guiscard united the south of Italy and the adjacent island of Sicily into one political unity, Naples being recognized as the metropolis. It was afterward successively under the sway of the emperors of Germany and the kings of France and Spain. Under the latter it became the capital of an independent kingdom, but having been brought within the vortex of the French Revolution, was handed over by Napoleon, first to his brother Joseph, and then to his brother-in-law Murat. The Congress of Vienna having restored the legitimate sovereignty, Naples received back its former masters. After a long period of misrule they were ejected by Garibaldi in 1860, and Naples was then incorporated into the kingdom of Italy. Pop. 697,917

The province of Naples covers an area of 351 square miles; pop. 1,360,324.

NAPLES YELLOW, or **NEAPOLITAN YELLOW,** a permanent orange-yellow pigment much used in oil painting and in glass and porcelain painting. It is essentially an antimonate of lead with an excess of lead oxide. It is prepared by fusing at a moderate heat, for two hours, a mixture of chemically pure tartar emetic, lead nitrate and sodium-chloride. When cooled the common salt dissolves, leaving a fine yellow powder.

NAPO, nā'pō, Ecuador, an affluent of the Amazon, which rises on the north side of Cotopaxi, and after a southeasterly course of about 800 miles, forming for a considerable distance the boundary between Colombia and Ecuador, joins the Amazon just beyond the eastern boundary, at Corocha, Peru. It is navigable nearly 500 miles for steamers; it flows through a region rich in mineral and vegetable wealth, but comparatively destitute of inhabitants.

NAPOLEON I, emperor of the French: b. Ajaccio, Corsica, 15 Aug. 1769; d. Longwood, Saint Helena, 5 May 1821. He was descended from the Italian family of Bonaparte (q.v.), of which the Corsican branch through him became the historic representative. Napoleon Bonaparte was the son of Charles Bonaparte, an advocate of some repute, and of Letitia Ramolino, whose family were Florentines. Of 13 children born to them, he was the fourth, and was the second son. At 10 he was sent to the military school of Brienne, where he remained till 1784.

His school companions regarded him as taciturn and morose; but as he was a Corsican, speaking very little French, and poor as well as proud, his conduct is doubtless to be ascribed as much to his circumstances as to his temperament. Toward those who, like Bourrienne, showed him sympathy, he was susceptible of strong and lasting attachments. From the annual report of the school it appears that he «distinguished himself in mathematics, was tolerably versed in history and geography, weak in Latin, general literature, and other accomplishments; of regular habits, well behaved and studious, and enjoying excellent health.» His favorite author was Plutarch. In October 1784 he repaired to the military school at Paris to complete his studies for the army; and in September 1785 received his commission as second lieutenant in the artillery regiment of La Fère. Soon afterward he was promoted to be first lieutenant in the regiment of Grenoble, then stationed at Valence. While here he devoted some attention to literature, gaining a prize offered by the Lyons Academy. He had the intention of describing an excursion he made to Mont Cenis in the style of Sterne's 'Sentimental Journey,' then much in favor on the Continent; but a much more suitable task was a 'History of Corsica,' which he began and communicated to Paoli, then living in exile in London.

Meantime the Revolution was rapidly developing. Many of Napoleon's fellow-officers at Valence openly took part with the Royalists, but he chose the popular side, though in a quiet and undemonstrative way as he had little liking for the turbulence of mobs. On 6 Feb. 1792 he became captain of artillery by seniority and, being in Paris the same year, he witnessed the insurrections of 20 June and 10 August. He was accompanied by his friend and biographer, Bourrienne (q.v.), who relates that on one of these occasions, when Napoleon saw the mob break into the Tuileries and force the king to don the red cap, he exclaimed, «It is all over with that poor man! A few discharges of grape would have sent all those despicable wretches fleeing!» Soon after he left for Corsica, where Paoli then held the chief command. The excesses of the Septembrists and Terrorists, however, induced Paoli to break with the Convention and seek the assistance of England. This brought him into conflict with Napoleon, who adhered to the Convention, which so exasperated the Corsicans against him that after a few skirmishes he was driven from the island along with his whole family. He made a short stay at Marseilles, where he published a small pamphlet, 'Le Souper de Beaucaire,' Republican in sentiment, but not Jacobinical, as has been asserted. He then set out for Paris, where he spent a part of the summer of 1793; and in September of that year was sent, with the commission of lieutenant-colonel of artillery, to assist in the reduction of Toulon, then in the hands of the English. The place was captured 19 December entirely through his strategic genius; and in the following February he was made a brigadier-general of artillery. Later in the year he was sent to Genoa to examine the state of the defenses of that city and to ascertain the political disposition of its inhabitants.

In the beginning of 1795 he was again in Paris in search of employment, but in spite of his known abilities was not at first successful. In his letters to his brother Joseph, written about this time, he complains of poverty and ennui, and seems to have thought of offering his services to the sultan of Turkey. On the 13th Vendémiaire IV (5 Oct. 1795), when the sections of Paris had risen against the Convention, Napoleon, named by Barras (q.v.), was commander of the 5,000 troops provided for its defense. Although he had had but a night in which to make arrangements for the dispersion of the populace, when the National Guards, as the defenders of the sections were called, advanced to the number of 30,000 along the quays of the Seine, the Rue Saint Honoré and the other approaches to the Tuileries, they found every point securely guarded. To their feeble musketry fire Napoleon replied by murderous discharges of grape. In less than an hour of actual fighting victory was secured for the Convention, which recognized the value of the young victor's services by appointing him to the command of the Army of the Interior.

About this time he made the acquaintance of Josephine Beauharnais, to whom he proposed marriage and was accepted. The ceremony took place 9 March 1796, and less than a week afterward he had to depart to assume the command of the Army of Italy, which for three or four years had been carrying on a desultory warfare against the Sardinians and the Austrians amid the defiles of the Alps and the Ligurian Apennines. His army consisted of only 40,000 men, and even those were badly fed and clothed, while the Allies could oppose him with a much larger force. In the end of March he set out from Nice and came up with the Allies at Montenotte, and inflicted on them a disastrous defeat (11 April). This victory separated the Sardinian from the Austrian army, and Napoleon, determined to crush them in detail, pursued the former and beat them at Millesimo (13th and 14th), and then fell on the latter at Dego (14th and 15th).

This opened up for him both the route to Turin and to Milan. Napoleon lost no time; the Sardinians who were retiring upon Turin, were overtaken and beaten at Mondovi (22d), and compelled to sue for peace; and the Austrians, who were falling back on Milan, were signally defeated at the battle of Lodi (10 May). On the 15th he entered Milan, where heavy contributions were levied on the state, and the principal works of art were seized and sent to Paris. Naples, Modena and Parma hastened to conclude a peace; the Pope was compelled to sign an armistice; and the whole of northern Italy was in the hands of the French. Mantua was the next object of attack. Wurmser, at the head of large Austrian reinforcements, advanced through the Tyrol to its defense; he was defeated at Castiglione 5 August and again at Bassano 8 September, which compelled him to take refuge behind the walls of Mantua. Not yet disheartened, Austria sent a third army in two divisions under Marshal Alvinczy and General Davidovich. This for a while held the French in check, but on 15 November a battle was begun at Arcole, which, after three days of hard fighting, gave the victory again to the French, and decided the result of the campaign. In January 1797, Alvinczy opened a fresh campaign by advancing at the head of 50,000 troops from Roveredo to the

NAPOLEON BONAPARTE

After a Painting by Paul Delaroche

relief of Mantua, but was completely routed by Napoleon on the 14th at Rivoli; and on 2 February Wurmser was compelled by famine to surrender at Mantua. On the same day Napoleon put an end to the armistice with the Pope, and invaded the states of the Church, beat the papal troops on the Senio, and took in quick succession the towns of Faenza, Ancona, Loretto and Tolentino. On the 19th the Pope was compelled to conclude a peace by which he surrendered Avignon, Bologna, Ferrara and the Romagna to France. Napoleon next entered the Tyrol, driving before him the Archduke Charles, who had undertaken another invasion of Italy. An armistice was agreed upon, 7 April, and Austria gave territory and indemnity to France, receiving Venetia in return. This closed the great Italian campaigns, in which Napoleon, by ingenuity of plan, celerity of movement and audacity in assault, far outgeneraled all his antagonists.

In December 1797 Napoleon returned to Paris; the enthusiasm of the Parisians was immense, and the festivals in his honor innumerable. About this time the Directory seems to have had the intention of invading England, and had brought an army together for that purpose. The command was conferred on Napoleon, who at first professed to favor the design, but who well knew its impracticability. It has been thought by many that this proposal was merely a feint to cover the real design of the Directory, namely, the invasion of Egypt, as a preliminary step to the conquest of British India. By 10 May 1798 an army of 36,000 men was collected and embarked at Toulon in a fleet commanded by Brueis (q.v.). A body of scientific and artistic explorers accompanied it. On 9 June the French landed at Malta, and the next day took possession of the island, in which they left a garrison. Ten days after the fleet resumed its voyage, reaching Alexandria on 1 July, and that city being taken, Napoleon and the army advanced on Cairo. Here they encountered a large body of Mamelukes, which, after a long and bloody struggle, known as the battle of the Pyramids, they repulsed. Many of the surrounding tribes thereupon submitted to the French, who thus for a while held a seeming possession of the whole of Egypt. Thinking himself secure in his conquest Napoleon immediately set about reorganizing the civil and military government of the country; but fortune was preparing for him a terrible reverse. The English admiral Nelson, who had long been in pursuit of his fleet, found it moored in the Bay of Abukir, and, with the exception of four vessels which contrived to escape, utterly destroyed it.

All means of return to Europe for the French were thus cut off, and to add to their misfortunes the sultan declared war against them, and a short time after serious disturbances broke out in Cairo, which were only suppressed by horrible massacres. Napoleon resolved to meet the Turkish forces assembling in Syria. In February 1799 he crossed the desert with about 13,000 men; took El-Arish and Gaza, and stormed Jaffa, where a great number of Turkish prisoners were deliberately massacred. On the 17th he reached Acre, which was defended by a Turkish garrison under Djezzar Pasha, assisted by Sir Sydney Smith and a small body of English sailors and marines. After 60 days he gave up the siege and returned to Egypt, leaving the whole country on fire behind him. He re-entered Cairo 14 June, having lost 4,000 men in the Syrian expedition. About the middle of July the sultan landed a force of 18,000 at Abukir, which Napoleon attacked and almost annihilated on the 25th. His position was far from agreeable, however; he had signally failed in the great objects of his expedition, and besides news had reached him of disaster to the French arms in Italy and of confusion in Paris. On 22 August he embarked in a frigate and 9 October landed at Fréjus, having narrowly escaped capture several times by the British Mediterranean cruisers. He arrived in Paris in time to take advantage of the political intrigues then rife. The credit of the government was wholly gone and its authority over its generals impaired. A revolution in the government 18 June had not made new directors more competent than their predecessors. Another change became necessary. Napoleon secured the co-operation of Moreau and the other generals then in the capital, and abolished the Directory on the 18th and 19th Brumaire (9–10 November). A new constitution was then drawn up, chiefly by the Abbé Siéyès, under which Napoleon was made first consul. As, however, he had the power of appointing to all public offices, of proposing all public measures in peace and in war, and the entire command of all administrative affairs, both civil and military, he was virtually ruler of France.

From this time Napeoleon's policy developed itself more distinctly; its objects were to establish order at home and to humiliate the enemies of the nation; but personal aggrandizement was an end scarcely less conspicuous. With sagacity, activity and boldness he undertook to reform civil affairs. He recruited the national treasury by various expedients, repealed the more violent laws passed during the Revolution, such as punishment for matters of opinion, reopened the churches and suppressed the Vendean insurrection by a series of decided but conciliatory measures. But he was well aware that his genius was essentially military, and that his most striking triumphs were those won on the battlefield. He offered Austria, England and Turkey, in theatrical phrases, terms of peace, which were rejected. He resolved to strike a blow first at Austria by a renewal of the glories of his former Italian campaign. An army of 36,000 men was concentrated with unparalleled rapidity and secrecy on the shores of the Lake of Geneva. On 13 May 1800 he began his daring march across the Great Saint Bernard, and almost before the Austrian general Melas was aware, had entered Milan (2 June). After several unimportant skirmishes he encountered the Austrians at Marengo (14 June), where he achieved another brilliant victory, which put all the Piedmontese fortresses, for the second time, in possession of the French.

Having established provisional government at Milan, Turin and Genoa, he returned to Paris 3 July. As his general, Moreau, had defeated the Archduke John in the decisive battle of Hohenlinden (3 December), Austria was reduced to sue for peace, and on 9 Feb. 1801 signed the Treaty of Lunéville, which was mainly based on that of Campo Formio. Treaties were subsequently concluded with Spain, Naples, the Pope, Bavaria, Portugal, Russia, Turkey, and finally 27 March 1802, the Peace of Amiens. Thus it seemed as if a universal cessation of hostilities were about to mark the history of Europe, and allow Napoleon the opportunity to crush the insurrection of the blacks in San Domingo. An army was sent out under Leclerc, some 20,000 of which were swept away by disease or the sword; the blacks were provoked by brutal cruelties to still more fearful massacres, in which about 60,000 whites perished. Toussaint l'Ouverture, an able and courageous negro who had made himself the leader of his unfortunate countrymen, was seized during a truce and carried to France, where he died in prison.

But the great occupation of Napoleon was the improvement of the interior affairs of the nation. A general amnesty allowed all the *émigrés* to return home; the Legion of Honor, a new order of knighthood, was established. Considerable attention was paid to such departments of education as tended to promote efficiency in the public service. Mathematics and physical science were encouraged at the expense of philosophy, ethics and social and political science. All prefects of departments and all mayors of cities were appointed by Napoleon, so that not a vestige of provincial or municipal freedom remained. On 2 Aug. 1802, Napoleon was proclaimed by a decree of the Senate consul for life, a step confirmed by a plebiscite of 3,000,000 votes. A *senatus consultum* issued some days after, reconstructing the electoral bodies and reducing the tribunate to 50 members, showed, however, that Napoleon was not yet satisfied with the authority he was clothed with, and many persons saw in the movement a step toward still more absolute power. It is to this period that the greatest of his services to France belongs. He assembled the first lawyers in the nation, under the presidency of Cambacérès, to draw up a code of civil laws. See CODE, *Code Napoléon.*

Meanwhile the state of Europe was beginning to look serious. Disturbances in Switzerland in the early part of 1802 induced Napoleon to resort to an armed mediation in its affairs; in August of the same year Elba was incorporated with France, Piedmont 11 September and Parma in October. England regarded these proceedings an an infringement of the Treaty of Amiens, and as remonstrances were ineffectual, there was in a short time a resumption of hostilities. On 18 May 1803, England declared war against France, having laid an embargo on all French ships in British ports. France retaliated by a decree that all Englishmen found on her territory should be detained as prisoners of war; and General Mortier was sent to occupy Hanover, as belonging to Great Britain. While these events were taking place a conspiracy for the overthrow of the first consul and the re-establishment of the Bourbons was discovered and thwarted. Napoleon pretended to see an accomplice of the conspirators in the Duc d'Enghien, and caused him to be arrested in neutral territory, brought to Vincennes and, after a mock trial, shot. Napoleon now seems to have thought it necessary that he should assume the imperial dignity. An appeal was made to the nation, and upward of 3,000,000 votes were given in favor of conferring on him the title and prerogatives of emperor, while less than 3,000 were against it. On 18 May 1804 Napoleon assumed the imperial title; and in order that due solemnity should not be wanting, he requested Pius VII to perform the ceremony of his coronation. The Pope assented and went to Paris 2 December. He was only allowed to perform part of the ceremony, however, as Napoleon snatched the crown from the pontiff's hands and placed it on his own head, performing a like office for his consort, Josephine. On 26 May 1805 he was also crowned king of Italy in the cathedral of Milan; and Eugène Beauharnais, his stepson, was appointed viceroy. He created a nobility with sounding titles; surrounded himself by a brilliant court; established all the etiquette of royalty; and introduced many practices marked by ostentation and parade.

Meanwhile the Northern powers listened to the solicitations of England, and united in a coalition against the new emperor. Russia, Austria and Sweden all joined in the charges of aggrandizement laid against Napoleon by the English government; but Prussia, tempted by him with the promise of Hanover, could not be brought to enter the coalition. The emperor abandoned his design of making a descent on England, broke up the camp at Boulogne, and concentrating his widely scattered forces at Mainz, September 1805, he marched at once across Bavaria at the head of 180,000 men, and compelled the Austrian general Mack to capitulate at Ulm, with 23,000 men (20 October). On 13 November he had reached Schönbrunn, near Vienna, where he received news of the victory of Nelson at Trafalgar, over the united fleets of France and Spain. Entering the Austrian capital, he made rapid preparations to meet the combined armies of Russia and Austria, then concentrating on the plains of Olmütz. On 2 December the three armies, each commanded by an emperor, met at Austerlitz. The struggle was desperate and long but at last victory was won by Napoleon. The rout of the Allies was complete. The Austrian emperor instantly sued for peace, giving up to France all his Italian and Adriatic territories. The Russian emperor retired behind his own frontiers, and Hanover was handed over to Prussia. As the king of Naples had received English and Russian troops into his dominions, Napoleon construed this act into one of direct hostility. In February 1806 a French army occupied the Continental part of the Neapolitan States, of which Joseph Bonaparte was declared king on the deposition of their former sovereign. The Bavarian republic was transformed into a kingdom dependent on France and given to another brother of the emperor, Louis, who took the title of king of Holland. Various districts in Germany and Italy were erected by the conqueror into dukedoms and bestowed on his most successful generals.

But the most important change of all was the formation of the Confederation of the Rhine on 12 July, and the dissolution of the old German Empire. On the death of the English Minister, Pitt, and the accession of Fox, negotiations were entered into for the cessation of hostilities between France and England, and as propositions were entertained toward the restoration of Hanover, the eyes of the Prussians were at once opened and war, however hazardous, was determined on and was declared on 8 October, the emperor being already at Bamberg directing the movements of his troops, which had remained in Germany. On the 14th Napoleon met the enemy at Jena, and inflicted on them a severe defeat; while his general, Davout, added on the same day to the French triumph by the brilliant victory of Auerstädt. On the 27th Napoleon entered the Prussian capital. After garrisoning all the important fortresses and reducing such towns as made a show of resistance, he issued the celebrated Berlin decree (see CONTINENTAL SYSTEM), directed against English commerce. This policy nearly ruined the commerce of France and the other European nations, while it increased the prosperity of England. Her fleets and cruisers swept the seas; nothing could be obtained from the colonies save through her, and the Continental merchants engaged in an extensive smuggling trade with the British, which it was impossible to prevent.

After the capture of Berlin Napoleon marched north against the Russians, who were advancing to assist the Prussians. He called on the Poles to rise, but was answered with little enthusiasm. At Pultusk, 28 Dec. 1806, and at Eylau, 8 Feb. 1807, he met with severe checks, and retired on the line of the Vistula; in the course of a few months, however, having received heavy reinforcements, he once more took the offensive. On 14 June was fought the battle of Friedland, which was so disastrous to the Russian arms that Alexander was compelled to sue for an armistice. The Peace of Tilsit was concluded 7–9 July, and by it the king of Prussia received back half of his dominions, and Russia undertook to close her ports against British vessels. The duchy of Warsaw was erected into a kingdom and given to the king of Saxony; out of the Prussian territories west of the Elbe the kingdom of Westphalia was formed and bestowed on Jerome, Napoleon's youngest brother; and Russia obtained a part of Prussian Poland, and by secret articles was allowed to take Finland from Sweden. Soon after the Peace of Tilsit was signed Napoleon entered into a war against Portugal, as that nation had refused to respect the Berlin decree, and Junot was sent to occupy Lisbon (30 Nov. 1807). The Pope refusing to carry out the Continental blockade and to recognize Joseph Bonaparte as king of Naples, Rome was occupied 2 Feb. 1808. The administrative affairs of Spain having fallen into inextricable confusion, Napoleon sent into that kingdom an army under Murat, who with difficulty took possession of the capital and by the Treaty of Bayonne Charles IV resigned the Spanish crown, which was given to Joseph Bonaparte, Murat (q.v.) receiving the vacant sovereignty of Naples.

The great body of the Spanish people rose against this summary disposal of the national crown, and England assisted them with immense supplies. Thus began the Peninsular War (q.v.), which lasted seven years. The Spaniards were at first successful; a French squadron was captured by the English at Cadiz, 14 June; General Dupont surrendered at Baylen, 22 July, with 18,000 men; Junot was defeated 21 August by Sir Arthur Wellesley at Vimeira. But Napoleon rushed to the scene of action in October at the head of 180,000 men, and entered Madrid in spite of all resistance by the Spaniards, 2 December. The British troops which had advanced to the aid of the Spaniards were driven back on Coruña, where they made a successful stand, but lost their general, Sir John Moore, 16 Jan. 1809. In the meantime Austria, alarmed at the aggressive policy of Napoleon, who had seized Tuscany and the states of the Church, and determined to profit by his absence in Spain, again declared war, and got together an effective army under the Archduke Charles. Napoleon hurried into Bavaria, encountered the archduke at Eckmühl (22 April), and completely defeated him; on 13 May he again entered Vienna. Reorganizing his shattered army, Charles likewise advanced toward Vienna on the opposite bank of the Danube. The French seized the island of Lobau, threw a bridge across the river and attacked the enemy at Aspern and Essling on the 21st and 22d, but were repulsed and thrown back on the island, which they proceeded to fortify, waiting the arrival of Eugène with the Army of Italy. On 5 July they debouched on the left bank of the Danube, and on the 6th the Austrians were crushed at Wagram. This enabled Napoleon to dictate his own terms of peace, which were agreed to on 14 October at Schönbrunn. On the preceding day an unsuccessful attempt was made to assassinate him by a young German enthusiast named Staaps Whether the subsequent marriage with the daughter of the Austrian emperor was in course of negotiation at Schönbrunn is doubtful, but soon after his return to Paris Napoleon informed Josephine of his determination to divorce her. He seems to have arrived at the conclusion that he could only put an end to the machinations of the old legitimate dynasties by intermarriage. Josephine, too, had borne him no children, and he was ambitious of perpetuating his power in his family. On 16 December an act of divorce was passed by the commissioners of the Senate, and by proxy 11 March (formally 2 April) 1810 he was married to the Archduchess Maria Louisa. The fruit of this union was a son, Napoleon François Charles Joseph, born 20 March 1811, and proclaimed in his cradle king of Rome. See REICHSTADT, DUKE OF.

The years 1810–11 were the period of Napoleon's greatest power. On the north he had annexed Holland, Friesland, Oldenburg, Bremen and all the coast-line as far as Hamburg, and on the south Rome and the southern papal provinces. His empire thus extended from the frontiers of Denmark to those of Naples, with Paris, Rome and Amsterdam as its first, second and third capitals, and it was divided into 130 provinces, having a total population of 42,000,000. He may also be said to have exercised almost unlimited control in Spain, the Italian kingdoms, Switzerland and the Confederation of the Rhine (q.v.). But now the tide began to turn. Russia found it impossible to carry out the Continental blockade without permanent injury to her great landowners; Sweden, which had accepted Bernadotte, one of Napoleon's generals, as king, was in a like predicament. The Berlin decree was frequently evaded, which involved Russia particularly in fresh complications, and in view of the war now inevitable that nation formed an alliance with Sweden. In May 1812 Napoleon declared war against Russia, and determined in spite of the dissuasion of his most prudent generals to invade the country. On 16 May Napoleon was in Dresden making arrangements for the great Russian campaign. The army he organized for it has been estimated at from 640,000 to 680,000 men, inclusive of Prussian, Austrian, German, Polish and Swiss auxiliaries. An army of 300,000 Russians, under Barclay de Tolly and Bagration, assembled on the banks of the Niemen to oppose him. On 24 June he crossed that river at Kovno, and the Russians retired step by step before him, deliberately wasting the country, carrying off all supplies and avoiding as far as possible general engagements. The French, however, pushed rapidly forward, overtook and routed the rear guard of Barclay's army at Ostrovno, 25 July, and on the 28th occupied Vitebsk. On 16 August the Russians made a stand at Smolensk against an advanced division of the French army, and when the latter entered the city on the 18th it was in ruins.

Both the opposing armies now took up their march toward Moscow. Kutusoff, who had succeeded Barclay, resolved to dispute the passage of the Borodino. An obstinate battle ensued 7 September, which cost the French nearly 30,000 men, and their opponents about double that number. On the 15th Napoleon entered Moscow, which had been deserted by its inhabitants, and which was nearly destroyed by a fire that began on the same night and lasted five days. The baffled French were compelled to seek shelter in the desolate surrounding country. Napoleon vainly attempted to negotiate with Alexander; it was impossible to pursue the Russians farther; nothing remained but retreat. The French army was now reduced below 120,000 men. For some time the weather was favorable, but the winter set in earlier than usual, and with extraordinary severity.

The line of retreat, too, led through the very districts which had been wasted on the advance. Swarms of mounted Cossacks incessantly harassed the French, now sadly demoralized by cold, famine, disease and fatigue. When the invaders left Smolensk (14 November) they numbered only 40,000 fighting men, and when they had fought their way over the Berezina (27th) there remained but 25,000. At Smorgoni Napoleon quitted the army (5 December), leaving Murat in command.

Napoleon reached his capital on the 18th and immediately ordered a fresh conscription, still determined on prosecuting the war. But the spirit of Europe was now fairly roused; kings, ecclesiastics and people rose unanimously against the devastator of the Continent, the terror of whose name had been destroyed by his disastrous reverse. A sixth coalition, consisting of Prussia, Russia, England, Sweden and Spain was formed, which early in 1813 sent its forces toward the Elbe. Napoleon had still an army of 350,000 in Germany. For some months he was everywhere victorious. On 2 May he defeated the Allies at Lützen, and on the 21st at Bautzen. He reached Breslau 1 June, and on the 4th concluded a six weeks' armistice, which gave the Allies time to reorganize and concentrate their forces and, what was of equal consequence, to gain over Austria. The campaign was reopened 16 August. The Allies advanced on Dresden, where Napoleon had his headquarters. The battle which ensued (see DRESDEN, BATTLE OF) 26–27 August was another dearly bought victory for the French, who were now so outnumbered that their chief was compelled to fall back on Leipzig. There he was completely hemmed in, and in the great «Battle of the Nations» (Völkerschlacht), as this battle of Leipzig is called, fought 16–19 October, he was completely defeated. The retreat across the Rhine was almost as disastrous as that from Moscow.

On Napoleon's arrival at Paris, 9 November, he succeeded in obtaining from the Senate, in spite of the opposition in the legislative body and the prevalent discontent of the people, a decree for a conscription of 300,000 men. With a fertility of resource and a genius for combination almost miraculous, he was able to enter on another campaign, which was this time to be conducted in France. From January to March he confronted the combined hosts of the Allies, inflicting defeat after defeat on them. But numbers were against him; a new and formidable enemy, Wellington, was rapidly advancing on the capital from the south. On 30 March the Allies, after a severe engagement, captured the fortifications of Paris, and on the 31st Alexander and Wellington entered the city amid the acclamations of the people.

On 6 April Napoleon abdicated at Fontainebleau in favor of his son. He was allowed the sovereignty of the island of Elba, with the title of emperor, and a revenue of 6,000,000 francs. After bidding his army adieu he departed for his new abode, landing from the British frigate *Undaunted* at Ferrajo 4 May, and Louis XVIII was restored. After a residence of 10 months, most of which was spent in intriguing with the Republicans and his own adherents, he made his escape from the island, and landed at Fréjus 1 March 1815, with an escort of 1,000 of his old guard. As soon as his arrival was known Ney and a large part of the army joined him, and he made a triumphal march on Paris, which he reached on the 20th. Louis was driven from his throne without a shot having been fired. The Allies were startled at the astounding event. Their armies once more marched toward the French frontier. Napoleon, hastily reorganizing the government on a rather more liberal basis than that of the empire, and having made vain attempts to open negotiations for peace, advanced to meet them. On 15 June he crossed the Sambre at the head of 130,000 men to attack the English and Prussians under Wellington and Blücher. On the 16th he defeated Blücher at Ligny, while at Quatre-Bras the English were held in check by Ney. The Prussians made an orderly and leisurely retreat, pursued by a division of the French army under Grouchy.

In order to preserve his communication with the Prussians, Wellington fell back upon Waterloo, where he was attacked by Napoleon on the 18th. The British held their ground obstinately during the greater part of the day, and in the evening, when Blücher, who had outmanœuvred Grouchy, came up, the French were completely crushed, and Napoleon's power forever broken. The retreat was a disorderly flight. The Allies marched without opposition on Paris. On the 22d Napoleon again abdicated in favor of his son; but being threatened by Fouché, who had assumed the direction of the government, and seeing no hope of escape from France, he surrendered at Rochefort to Captain Maitland of the British warship *Bellerophon,* claiming the hospitality and protection of the British government. Captain Maitland was instructed to detain him as a prisoner, and then transfer him to the *Northumberland,* which was to convey him to the island of Saint Helena, where he was to be confined for the rest of his life, according to a convention signed at Paris, 20 August, between Great Britain, Austria, Russia and Prussia. He landed there 16 October. In July 1816 Sir Hudson Lowe was sent out as governor of the island. From the very first Napoleon seems to have quarreled with that officer, and he appealed to the sympathy of the world through reports of the ill treatment he was subjected to. The governor had no power to remedy the chief causes of the prisoner's complaint. In September 1818 Napoleon's health began to fail. He refused medicine, would not ride, toward the end of 1820 grew worse and died at last of cancer of the stomach. On 8 May 1821 he was buried on the island; but in 1840, in accordance with his own wishes, his remains were removed to Paris, and there, under the dome of the Hôtel des Invalides, they found their final resting-place. See WATERLOO, BATTLE OF; NAPOLEON'S TOMB; FRANCE, HISTORY OF.

Bibliography.— Thiers, 'History of the French Revolution' (1823–27) and 'History of the Consulate and Empire' (1845–61); Scott, 'Life of Napoleon' (1827); Bignon, 'Histoire de France sous Napoléon' (1829–50); Thibaudeau, 'Le consulat et l'empire' (1834–35); Lanfrey, 'History of Napoleon' (1869–75); Jung, 'Bonaparte et son temps' (1880–81); Ropes, 'The First Napoleon' (1885) and 'Campaign of Waterloo' (1893); Fournier, 'Napoleon I, eine Biographie' (1886–89); Sargent, 'Napoleon Bonaparte's First Campaign' (1894) and 'Campaign of Marengo' (1897). For the relations of Napoleon with the United States, Adams, 'History of the United States, 1801–17' (1889–91) should be consulted. The 'Correspondance de l'Empereur Napoléon I' (1858–70) is a main source of original documentary history. Of works of a more personal character, dealing with the life of Napoleon from various points of view, among the more important are those of Bourrienne, Talleyrand, Metternich, Rémusat, Marbot, Montholon, Pasquier, Ségur, Las Casas, O'Meara, Sachet, Messéna, Marmont and Roederer. As recent writings of another sort bearing on Napoleon's personal history, those of Levy and Mason deserve particular notice. The work of Rose, 'Life of Napoleon I' (1901), is the latest complete biography in English. Channing's essay on Napoleon, and Emerson's chapter in 'Representative Men,' as well as Carlyle's pictures in 'Heroes,' are still worthy of attention.

NAPOLEON II, son of Napoleon I. See REICHSTADT, DUKE OF.

NAPOLEON III (CHARLES LOUIS NAPOLEON BONAPARTE), emperor of the French: b. Paris, 20 April 1808; d. Chiselhurst, England, 9 Jan. 1873. He was the son of Louis Bonaparte (q.v.), king of Holland. He was taken by his mother, Queen Hortense, to Switzerland in 1816, was educated at the gymnasium of Augsburg and the military school at Thum, joined the unsuccessful Italian revolt against papal rule in Romagna, and by a conspiracy at Strassburg on 30 Oct. 1836, was declared emperor. He was arrested and sent without trial to the United States, returned to Switzerland in 1837, lived in London in 1838–40, and on 6 Aug. 1840 landed at Boulogne for a fresh attempt against Louis Philippe. This time he was imprisoned in the fortress of Ham, under a life sentence; but he contrived his escape 25 May 1846. During this time he had leisure for the exercise of his literary abilities, and the result was the works 'Aux manes de l'Empereur'; 'Fragments Historiques'; 'Analyse de la Réveries politiques'; 'Réponse à M. de Lamartine'; 'Extinction du Paupérisme'; besides contributions to the 'Dictionnaire de la Conversation,' and several articles to democratic newspapers. On the outbreak of the Revolution of 1848 he hastened from England to Paris, and in a letter to the provisional government declared that he came to serve under the republican flag (28 Feb. 1848). On the day following he issued another letter announcing that as the government deemed his presence in Paris dangerous he would immediately quit the country. He accordingly returned to London, where he served as a special constable on the occasion of the great Chartist demonstration of April (1848). In the election of September he was put forward by Paris and three other departments. He returned to Paris and on 26 September took his seat.

He at once commenced through his zealous associates his candidature for the Presidency. On the day of the election, 10 December, it was found that out of 7,500,000 votes Louis Napoleon had obtained 5,434,226. On the 20th the prince-president, as he was now called, took the oath of allegiance to the republic. For a time the greatest harmony seemed to be reestablished; the President selected his ministers from the ranks of the various political parties, and strove to gain a majority in the assembly by the adoption of a strictly conservative policy. On 2 Dec. 1849 was formed a new ministry, the members of which were merely tools of the President. It was evident that a crisis was approaching. At last on 2 Dec. 1851 the *coup d'état* came. Paris was overawed by the army; there was needless butchery in the streets; reports of approval by Paris of this course were sent to the provinces. The empire was reestablished in Louis Napoleon by a vote of 8,000,000 to 640,000. On 29 Jan. 1853 the new sovereign married Eugénie Marie de Montijo, Countess de Teba. In 1854 Napoleon, in conjunction with England, entered the Crimean War in the interest of Turkey against Russia — a war which was carried on by all the parties with great vigor, until a peace was concluded, 30 March 1856, the terms of which were the neutralization of the Black Sea, the abandonment by Russia of her protectorate of the Danubian principalities and a rearrangement of frontier territory between Russia and Turkey, to the advantage of the latter power. (See CRIMEA, *History*). About the beginning of the year 1859 it was evident that another European war was imminent. Northern Italy was groaning under the Austrian yoke; Sardinia demanded a separate government for Lombardy and Venetia, which Austria refused to grant. War was declared between that country and Sardinia about the end of April, and Napoleon took up arms in favor of his Italian ally, Victor Emmanuel. The two allied sovereigns took the field in person. Montebello, Magenta, Marignano and Solferino were brilliant victories for the Allies. By the terms of the Peace of Villafranca, Austria ceded Lombardy to Italy, and the provinces of Savoy and Nice were given to France.

A second distant expedition was undertaken, but had not a like success. Toward the end of 1861 France, England and Spain agreed to dispatch a joint expedition to Mexico for the purpose of exacting redress of injuries of long continuance inflicted on the subjects of the respective allies, and the enforcement of pecuniary claims, which were obstinately contested by the Mexican government. The extravagant demands of M. de Soligny induced the English and Spaniards to believe that Napoleon had some ulterior object in view, and they withdrew from further intervention (April 1862). The French army continued the quarrel alone. On 10 June General Bazaine led his troops into the Mexican capital amid many demonstrations of enthusiasm. An imperial form of government was initiated, and Maxmilian (q.v.), Archduke of Austria, was placed at its head with the title of emperor. The United States considered this a piece of treachery, and after the Civil War dispatched Sheridan with troops who speedily put an end to French aggression and Mexican instability. Maximilian's death caused Napoleon's policy to be viewed with suspicion in France. The emperor opened the Suez Canal, entertained Europe at the World's Exposition, rebuilt and greatly beautified Paris. But France lost slowly in prestige, and there was a decline of administrative integrity.

On the conclusion of the Austro-Prussian War of 1866, Napoleon, jealous of the growing power of Prussia, demanded a reconstruction of frontier, claiming, by way of compensation for his non-intervention in the quarrel, Prussian territory on the Saar, a claim peremptorily refused. The ill-feeling between the two nations was increased in 1867, when the king of Holland signified his intention to cede Luxemburg to France. The cession was strongly resisted by Prussia, and at the London conference (7–11 May) the neutralization of the duchy was agreed to by treaty under the guarantee of the Great Powers. It could no longer be concealed, however, that a rupture between France and Prussia was imminent, and in 1870, on the Spanish crown being offered to Leopold of Hohenzollern, Napoleon demanded that the king of Prussia should compel that prince to refuse it. Notwithstanding the subsequent renunciation of the crown by Leopold, war was declared by France (19 July). (See Franco-German War). On the 28th Napoleon set out to take the chief command. After Sedan, he had a personal interview with King William, who assigned to him Wilhelmshöhe, near Cassel, as a place of residence during his captivity One of the immediate consequences of this disaster was a revolution in Paris. Gambetta, Jules Favre and several other members of the Corps Législatif proclaimed a republic and the dethronement of the emperor (4 September). The empress and her son secretly quitted Paris and repaired to England, where they took up their residence at Camden House, Chiselhurst. Here they were rejoined by the emperor, when he regained his freedom in March 1871, and here he remained till his death.

Napoleon III was rather a student and littérateur than a statesman. He was not an efficient administrator and was most unfortunate in his advisers and subordinates. At the time of the Franco-German War he appears to have been quite deceived as to the military strength of France and its readiness for the conflict. Besides the literary works already mentioned, Napoleon III is the author of an uncompleted ‹History of Julius Cæsar› (1865–66), and various productions collected and published in 1854–69 and 1873. (See France; *History Since* 1815). Consult Gottschalk (1871); von Sybel (1873), and Jerrold (1877) for biography; also Hugo, ‹Histoire d'un Crime› (1877) and various standard histories of modern Europe; also De la Gorce, ‹Histoire du second empire› (4 vols., Paris 1885–98); Simson, ‹Über die Beziehungen Napoleons III zu Preussen und Deutschland› (Freiburg 1882); Ebeling, ‹Napoleon III und sein Hof› (Cologne 1891–94); Imbert, A. L., ‹The Court of the Second Empire› (Eng. trans., 1898); Hugo, ‹Napoleon the Little› (Eng. trans., 1909).

NAPOLEON, Eugène Louis Jean Joseph, Prince Imperial of France, only son of Napoleon III: b. in the Tuileries, Paris, 16 March 1856; d. South Africa, 1 June 1879. He fought for the Imperial arms in the Franco-German War of 1870–71, but when disaster seemed imminent was sent to join his mother in England, whither she had fled. He was proclaimed Napoleon IV by his adherents in 1874. In 1879 he joined a British expedition against the Zulus in South Africa and was killed in ambush. He was buried beside his father at Farnborough, England. Consult Barlee, Ellen, ‹Life of Napoleon, Prince Imperial of France› (London 1889); Martinet, A., ‹Le prince impérial› (ib. 1895); Barthez, E., ‹Empress Eugenie and her Circle› (New York 1913).

NAPOLEON, Joseph Charles Paul, Prince, a son of Jerome Bonaparte. See Bonaparte, Jerome.

NAPOLEON, Ohio, village, county-seat of Henry County, on the Maumee River and the Miami and Erie Canal, and on the Lima Northern and the Wabash and Detroit railroads, about 38 miles southwest of Toledo. Its chief manufactures are flour and dairy products as well as windmills, tanks, threshing machinery, separators, flour, etc. It has considerable trade in farm and dairy products and livestock. The village owns and operates the electric-light plant and the waterworks. Pop. 4,132.

NAPOLEON, a piece of French money valued at $4 or 20 francs. See Louis d'Or.

NAPOLEON GUN. See Artillery.

NAPOLEON LE PETIT, lė pė-tē («Napoleon the Little»), the title of Victor Hugo's savage satire on Louis Napoleon. (Brussels 1852).

NAPOLEON'S TOMB, the burial-place of Napoleon Bonaparte under the dome of the Invalides in Paris. It has the form of a circular crypt 20 feet deep and 36 in diameter, open at the top. The tomb was designed by Visconti, and on the walls are 10 marble reliefs by Simart. The sarcophagus is 13 feet long, 6½ wide, 14½ high, cut from a single block of red porphyry, 67 tons in weight, surrounded by 12 victories by Pradier. The inscription above the entrance to the crypt is taken from Napoleon's will: «I desire that my ashes shall rest on the banks of the Seine, in the midst of the French people that I have loved so well.» Two adjoining tombs are those of the emperor's friend, Duroc, and his companion, Bertrand. Napoleon's remains were brought here in 1840 from Saint Helena.

NAPRAPATHY, năp-răp'ă'thē, the science of drugless healing, in contradistinction to the treatment of disease by surgery or medicine. It is founded upon the researches of Dr. Oakley Smith, who contended that human ailments are traceable to sprained or diseased ligaments connected with the spinal column, thorax and pelvis. It is claimed that by overcoming these, with scientific manipulation. which relieves the pressure upon the nerves and the arterial system, most of the diseases of the human body cannot only be overcome but a permanent cure effected. It is also claimed that diseased conditions incurable by older methods yield to naprapathic treatment.

NAQUATEZ (nä'kwā-tēz) **INDIANS.** See CREEKS.

NAQUET, na'kā', **Alfred Joseph**, French chemist and social reformer: b. Carpentras, 6 Oct. 1834; d. Paris, 10 Nov. 1916. In 1867 he came into prominence, losing his professorship in the faculty of medicine in Paris and being condemned to 15 months' imprisonment for his share in the activities of a secret society. In 1869 he fled to Spain after the publication of his book, ‹Religion, propriéte, famille.› He returned September 1870 and in the Revolution became Secretary of National Defense. Soon after he was elected to the Chamber of Deputies and began agitation against the French marriage laws. His agitation for the re-establishment of divorce resulted in the law of 1884, and in 1886, through his continued efforts, divorce became legal after three years of definite separation, on the demand of one of the parties concerned. Besides a professional work, ‹Principes de chimie fondés sur les théories modernes› (1865; 5th ed., 1890; Eng. trans. 1868), he wrote numerous works on social questions, including ‹Le divorce› (1877; 2d ed., 1881); ‹La loi du divorce› (1903); ‹L'Humanité et la Patrie› (1901); ‹L'Anarchie et la collectivism› (1904); ‹Désarmement ou alliance anglaise› (1908).

NARAKA, or **NURUK**, in Hindu mythology, a term equivalent to the English word hell. In Naraka there are 28 divisions, in which sinners of as many different classes are confined and subjected to tortures corresponding to the gravity of their offenses.

NARBADA, när-bä'dä. See NERBUDDA.

NARBONNE, när-bŏn, France, the chief town of an arrondissement in the department of Aude, in a beautiful hill-girt plain, eight miles from the Mediterranean and 36 miles by rail east of Carcassonne, and commanding the entrance into Spain by the southwest. Boulevards occupy the site of the mediæval ramparts removed since 1865. The town, traversed by the Robine Canal, has dark and winding streets lined with ill-built houses and is generally unattractive. It is, however, of historical interest as the Roman Narbo Martius, their earliest colony (118 B.C.) beyond the Alps. It flourished under Tiberius, its schools for a long time rivaling those of Rome. About 309 A.D. it became the capital of Gallia Narbonensis, and had its capitol, forum, theatre, aqueducts, triumphal arches, etc., of which there are few remains owing to the vandalism of Francis I in using them as building materials. In 412 it was taken by the Visigoths, in 719 by the Saracens, from whom it was recovered by Pepin in 759, to fall a century later to the Northmen. During the 11th and 12th centuries it was a prosperous manufacturing city, but subsequently deteriorated owing to the silting of its harbor. Its port, La Nouvelle, is 13 miles distant by canal. The principal edifices are the Romanesque church of Saint Paul Serge (1229); the quondam cathedral of Saint Just (1272–1332), only the fine Gothic choir of which, 131 feet high, has been completed; and the former archbishop's palace, now the city hall, in which are a good museum, a library and a picture gallery. A seminary and hydrographical school are among its educational institutions. The white heather honey of Narbonne maintains its ancient celebrity; the wine is chiefly used for blending purposes, its production being now carefully supervised by the œnological station founded in 1894. The manufacture of bricks and tiles, sulphur refining, cooperage and the distillation of brandy are among its industries. Pop. 28,173.

NARCISSISM, när-sĭs'sĭzm'. In the newer analytic psychology Narcissism is the stage in the development of the human psyche, when the ego derives the gratifications of its libido (q.v.) from the projections of its own mental states. In the development of the child the autoerotic pleasures derived from merely masturbatory sources in different parts of the body give way, in the average individual near or after the time of puberty, to a need for gaining satisfactions from activities exercised upon the world of external reality and not upon self. In the love life of the individual this change from autoerotism to the final selection of the love object of the opposite sex passes through a stage called Narcissism. Thus the child takes pleasure in or pain from the treatment it *gets from* other people in contradistinction to the adult satisfaction of giving pleasure or inflicting pain on other people. That is, the child, receiving as it does the pleasure at first solely from its own states and activities, learns eventually through experience to associate pleasurable and painful sensations *with* certain external happenings; e.g., from having burned itself it associates pain with the sight of a stove or a match, and from having gotten pleasure from eating jam, it associates the pleasure with the jam. Or, if it eats too much, and is of the proper grade of intelligence, it may associate unpleasant feelings with jam. At any rate there is here a projection (see MECHANISMS, MENTAL) of the really subjective pleasure or pain feeling, which is thereby attributed to the jam as a quality which jam uniformly has. This process, which is psychological, but not logical, is the same as that carried out when the child forms a concept of another person. Therefore the concept of this other person than itself is made up of feelings which really belong to the child but which it irrationally attributes to other persons.

The intermediate transitional stage in the development is where the individual not merely regards his own body as a source of gratification (pure erotism) but with absolute naïveté looks upon his own personality or some other which he identifies with himself in the same light as he will later regard the true object love. That is, the autoerotic satisfaction comes from an exercise of the child's own body on itself or, as is seen in day-dreaming, or romancing of almost any kind, from an exercise of its own mind with its own mental material, uncorrelated with external reality. In the Narcissistic stage of the development of the human psyche the young person shifts from a crassly subjective form of gratification of the libido to a more objective form, without, however, realizing the actual differences between the projections of his own mind and the concrete facts of the characters of other people. The narcissistic youth finds some other person to love, but naively endows that other with his own qualities, not making, or perhaps not able to make, the necessary discriminations between what he thinks the other is and what the other really is. Thus a young person will find some other personality attractive and suppose that because some elements of the other are agreeable, the rest of the elements are so, and be very much disturbed, if not disordered, at the occasional outcroppings of uncongenial traits. Just as in the legend of Narcissus, who is fabled to have fallen in love with his own reflection which he perchance saw in a pool, and later to have pined away in ungratified desire for the being he saw but could never touch, so the ordinary person of to-day may, through constitution or lack of proper training, become a modern Narcissus, who desires merely the gratification of his projected unconscious wishes. He thinks his own thoughts will be given external reality simply by wishing for it, either unable or unwilling to see the discrepancy between his essentially autoerotic desires and the actual nature of external reality. The average child is taught by experience to derive satisfaction from exerting the limit of his ability upon external reality in order to make it conform to his wishes, and to take so much pleasure from the exertion that there will be no pain from the necessary disappointment of his wishes. This the fabled Narcissus never did, but tried again and again to embrace the beautiful being in the pool, where the average youth would have seen the impracticability of such action.

The subject of Narcissism is extremely important in the modern analytical explanation of the mental disease paranoia. In this disease, which is characterized by a systematized suspicion and delusion of persecution, the subject takes unconsciously and crystallizes the attitude expressed by Narcissism. The process of mental development which shows how vitally important in the usual development of the psyche is the next and last step to adulthood, may be outlined somewhat as follows: The various phases of the situation have been illustrated by the development of the implications of the simple statement «I love him,» supposing, for the sake of illustration, that the subject «I» is a male. If the idea represented by the sentence is followed out in real life, there results a more or less veiled homosexuality and the lack of adaptation of the individual to external reality is not so great as if the idea «I love him» is completely repressed into the unconscious. The idea «I love him» in the ego of a male, however, particularly if thus repressed, is always inevitably transformed, by virtue of the principle of *ambivalence* into «I hate him,» and the inference from that is readily made to «He hates me,» which is the basis on which this type of paranoid trend is built. Men who have this buried homosexuality in their unconscious are helpless without analysis, because they do not know of the existence of it and can never find it themselves. Therefore persons who are unduly suspicious of those around them have frequently the germ of a very serious mental disease, the cure of which requires a very special technique and the prevention of which would be of the utmost importance. Narcissism is thus seen to be an unconscious subjective homosexuality, differing from other forms of autoerotism in being applicable only to the whole individuality instead of to parts of it, and by reason of its total applicability being the cause of the tendencies which, when allowed to become extreme, lead to paranoia or paranoid states, as well as to alcoholism and various drug addictions. Consult Jelliffe and White, 'Diseases of the Human System' (1917).

NARCISSUS, när-sĭs'ŭs, in Greek mythology, the son of the river god Cephissus. Narcissus was of surpassing beauty, but excessively vain and inaccessible to the feeling of love. Echo pined away to a mere voice because her love for him found no return. Nemesis determined to punish him for his coldness of heart, and caused him to drink at a certain fountain, wherein he saw his own image, and was seized with a passion for himself of which he pined away. The gods transformed him into the flower which still bears his name. See ECHO; MYTHOLOGY.

NARCISSUS, a genus of plants of the order *Amaryllidaceæ* (q.v.). The species, numbering from 16 to about 50, according to different authors, have bulbous roots, narrow grass-like leaves, and generally white or yellow flowers borne singly or in small clusters and protruding from a dry spathe at the summit of a leafless scape. Because of their hardiness, ease of cultivation, habit of blooming in early spring, beauty and fragrance, many of the species and their numerous hybrids and varieties have been general garden favorites for centuries. A few produce their blossoms in the autumn (for example, *N. serotinus*, *N. ele-*

NARCISSUS

gans and *N. viridiflorus*); but they are rarely cultivated. Some are useful for winter forcing, especially the polyanthus narcissus (*N. tazetta*), with its popular forms the «paper white» and the «Chinese sacred lily.» In general, the garden species succeed best in well-drained garden soil of medium texture and richness. The bulbs should be planted in autumn about five inches deep and three inches apart, and should not be disturbed until they appear to be failing, perhaps after three years. Then when the foliage has died down the clumps may be dug, the bulbs divided, cleaned and stored in a cool dry place until planting time. Among the most popular species are the poet's narcissus (*N. poeticus*), also known as pheasant's eye, the jonquil (*N. jonquilla*), and *N. tazetta* mentioned above. The Lent lily (*N. pseudo-narcissus*), or daffodil, is also one of the most widespread and hardy. See DAFFODIL.

NARCOSIS, or NARCOTISM (Greek, «stupor»), insensibility more or less profound, the result of absorption by the blood, and subsequent action on the brain, of certain drugs in poisonous amount, or of certain excretory elements, as in uræmia.

NARCOTICS (from Greek *ναρκοῦν*, to benumb), substances which have the property of stupefying. In small (medicinal) doses they either quiet undue irritability of the nervous system, producing sleep and relieving pain or spasm, or they excite or stimulate the normal irritability. Opium and alcohol, for example, are sometimes used as «bracers.» Narcotics are too frequently used for slight ailments or fancied ones because the repeated or habitual use of small doses is dangerous, as it is apt to excite a craving for and the use of larger or poisonous doses. (See POISONS). Poisonous doses produce stupor, coma and sometimes convulsions and death. Though the effects of most of the narcotics resemble more or less those of opium each narcotic affects the system in a peculiar way. Belladonna, for example, dries the throat, dims the vision, dilates the pupils of the eyes (opium contracts them), and produces delirium. Some narcotics produce constipation, others do not. Some act principally upon the brain, others on the alimentary canal or bronchial tubes. The principal narcotics are opium (with its alkaloids, such as morphia, codeine and thebaia, and preparations of it — paregoric, laudanum, etc.), belladonna, camphor, hyoscyamus or henbane, caffeine, chloral hydrate, alcohol, Indian hemp, hops, bromide of potassium and stramonium. There is also a group of chemical organic compounds which are narcotics, such as paraldehyde, sulphonal and trional. Narcotics should be used with extreme caution, as the susceptibility to their poisonous effects varies in different persons. Of late years the market has been flooded with so-called paincures, carminatives, cordials, soothing-syrups, etc., warranted to be harmless, but which are in fact narcotics, in mixtures more or less agreeable to the taste, but none the less liable to do harm. Children are more susceptible to the influence of narcotics than adults, hence the risk of giving them to children is greater. See ANÆSTHETICS; ANALGESICS; COAL TAR; HYPNOTICS; TOBACCO.

NARCOTINE, an alkaloid which forms from 5 to 6 per cent of the opium from Asia Minor and a larger proportion of the opium from India and Persia. It has the chemical formula $C_{22}H_{23}NO_7$, and acts as a narcotic poison. It may be prepared as follows: The morphine content of the opium is first dissolved out with water — in which narcotine is almost entirely insoluble. The residue is then exhausted with dilute hydrochloric acid, forming narcotine hydrochloride. The alkaloidal bases that the extract contains are precipitated by the addition of caustic potash. The precipitated bases are then redissolved, and the solution is treated with oxalic acid to precipitate the papaverine that it contains, after which the filtered solution is treated with ammonia to throw down the narcotine. The precipitate so obtained is purified by recrystallization from alcohol. A simpler method, but more expensive, is to boil the opium with ether in which the narcotine dissolves. Narcotine was the first alkaloid obtained from opium, of which it constitutes from 1 to 8 per cent by weight. It is almost insoluble in cold water, moderately soluble in alcohol and in ether, and readily soluble in chloroform. It crystallizes in trimetric prisms, or in radiating needle-like forms, which melt at 345° F. Aqueous solutions of the alkaloid are neutral, and solutions in other menstrua are but feebly alkaline. Narcotine (unlike the other alkaloids that opium contains) appears to exist in opium in the free state, and not in the form of a salt. Its salts do not crystallize readily, their aqueous solutions are acid, and are decomposed when evaporated, with separation of free narcotine. A larger dose of narcotine is required to produce the same effect as a given quantity of morphine or codeine.

NARD, a plant, spikenard. See ARALIA.

NARES, nārz, SIR **George Strong,** English vice-admiral and Arctic explorer: b. Aberdeen, 1831; d. 15 Jan. 1915. The son of a naval officer, he was educated at the Royal Naval College and entered the navy in 1845. After serving on the Australian station he was appointed mate on the *Resolute* in the Arctic expedition of 1852–54, taking part in some long sledge journeys, covering 665 miles in 69 days and later 586 miles in 56 days. He next served in the Crimean War; on the Mediterranean station; and lieutenant in charge of cadets, for whose instruction he wrote ‹The Naval Cadet's Guide› (1860), afterward published under the title of ‹Seamanship.› In 1866–67 he surveyed the coasts of Australia; in 1869 the Gulf of Suez, and from 1872 to 1874 commanded the *Challenger* on a deep-sea exploration round the world. In 1875 he was placed at the head of the North Polar Expedition, consisting of H. M. S. *Alert* and *Discovery*, with the object of reaching the Pole via Smith's Sound. Leaving the *Discovery* in Lady Franklin Bay, Nares proceeded in the *Alert* along the western shore of Robeson Channel, reaching the then highest latitude (82° 27′) and long. 61° 22′. The sun disappeared for 142 days from 12 Oct. 1875; on the return of daylight, a sledge expedition of 53 men attempted a «dash» to the Pole, returning after 72 days, suffering intensely from the cold and scurvy. They had planted the British flag in lat. 83° 10′ 26″ N. Returning home in Oct. 1876, Nares was employed in various duties till 1878, when he was sent in the *Alert* to survey Magellan Strait, South America. He was created K. C. B. in 1876. For 18 years he was next engaged at the Board of Trade as professional officer of the harbor department; then he became Acting Conservator of the River Mersey, retiring in 1886. He published a number of reports on his voyages.

NAREW, nä'rĕf, river in northern Poland rising in the government of Grodno out of the swamps of Byelovyezh and becoming navigable near Tikozyn, it flows past Lomza and Pultusk entering the Bug below the latter town. It has a length of 271 miles. The Niemen is connected with this river by the Augustowo Canal.

NARIAKI, Daimyo, of Mito, a member of the Gonsanké, or three princelv Tokugawa families of Kiushiū, Owari and Mito, who ranked first among the territorial nobility of Japan. He flourished in the middle of the 19th century, and was noted as the leader of the seclusion policy of Japan. While working hard to improve the military and educational systems and to stir up her warlike spirit which the long years of peace had greatly diminished, he recognized that his country must soon be called upon to take her place among the nations of the world, yet he deliberately proclaimed the doctrine of the seclusion of Japan, in the meantime working strenuously to transform Japan along the lines of the very civilization and culture he pretended to be fighting. Nariaki's personality was the strongest and his intelligence the keenest, in his day, in Japan, and he soon was able to make his cry of the «expulsion of the barbarians» that of the whole country. History shows that he was, by far, the best informed man in his day, in Japan, on «foreign ways.» He fully appreciated the importance of providing Japan with the armaments and sciences of the western nations; and as early as 1849 he had begun spending comparatively large sums of money in the manufacture of arms along the latest European models. Against all opposition he prepared Japan for her wonderful leap into the arena of western civilization, while all the time he was misunderstood at home and abroad. Consult Okuma, Count Shigénobu, ‹Fifty Years of Japan› (English trans. by Marcus B. Huish, London 1909).

NARIÑO, nä-rē'ñō, **Antonio,** Colombian politician: b. Bogota, Colombia, 1765; d. Leiva, Colombia, 13 Dec. 1823. He was educated in the college of San Bartolome in Bogota and entered the magistracy. His writings of a revolutionary character brought him into trouble and in 1795 after a tedious trial he was transported to Spain under sentence of 10 years' penal servitude. Escaping in 1797 he returned to his own country but was again imprisoned and not released until the Revolution of 1810, when he joined the patriot army. He was elected President in 1811 and later dictator. On the outbreak of civil war Nariño defeated the Federalists, and then resigning his dictatorship marched against the Royalist forces in the south. His success was followed by defeat at Pasto in 1814 when he was captured and sent a prisoner to Spain. He was held a prisoner until 1820 when he returned to his own country. In 1821 he was elected senator, but declined the vice-presidency in 1822, and ill-health compelled him to retire soon after his appointment as commander-in-chief in 1823.

NARNI, när'nē, Italy, town known to the ancients as Nequinum and later as Narnia. It is located in the province Perugia on a cliff beneath which, in a deep ravine, flows the Nera (the ancient Nar). It is on the Rome-Foligno Railway, is seat of a bishop and has a cathedral dating from the 11th to 15th centuries, besides other churches erected from the 9th to the 15th century. Here are also ancient dwellings and castle, a town-hall dating from the 13th to 16th century, strong remains of a Roman bridge (of Augustus), an ancient aqueduct, etc. Its industries number leather and rubber-ware factories and oil presses. This is the birthplace of the Emperor Nerva and of Pope John XIII. Pop. 12,943.

NARO, nä'rō, Italy, town in the province Girgenti, Sicily, on the coastal river Naro, 12 miles from Girgenti. It has a castle dating from the Middle Ages and Early Christian catacombs. In the vicinity are large sulphur pits. The population in 1911 was 13,802.

NARRAGANSETT (năr-ą-găn'sĕt) **BAY,** an inlet of the Atlantic Ocean, extending into the State of Rhode Island about 28 miles. At its entrance, from Sakonnet Point to Point Judith, the bay is about 8 miles wide. One of its channels, on the east, is called Sakonnet River, and the chief arms of the bay are on the east, Mount Hope Bay, on the west, Greenwich Bay. The principal rivers which enter the bay are, at its head, Providence River, from the east Taunton, from the west Pawtuxet. The largest island in the bay is Rhode Island, and others are Conanicut, Prudence and Hog. Several places of importance are on the shores of the bay, chief of which are Providence at the mouth of the Providence River, Newport on Rhode Island and Fall River, at the mouth of the Taunton. Narragansett Bay is of great importance to the State, as it gives opportunities for commerce and transportation. The first explorers of the northeast coast of the United States mention this bay. Consult Bacon, E. M., ‹Narragansett Bay› (New York 1904).

NARRAGANSETT INDIANS, an American tribe formerly occupying the territory now comprised in the State of Rhode Island and the eastern part of Long Island. Shortly after the arrival of the pilgrims they manifested symptoms of hostility; and as an expression of sentiment Canonicus, their chief, sent to Plymouth a bundle of arrows wrapped in the skin of a rattlesnake; to which Bradford, the governor, replied with the same skin filled with powder and shot. This significant retort secured, if not the good-will, at least the peaceableness of the sagacious chief. In the Pequot War they aided the colonists, but not unanimously. In the winter of 1675, during King Philip's War, that chief having taken refuge with the tribe, the colonists, apprehending that they would join his cause, made a secret attack upon their principal fort, killing about 1,000 warriors, destroying all their provisions, and exposing those who escaped to cold and famine, of which very many died. The Narragansetts from this time waged incessant war with the whites. They have now entirely disappeared as a race, although some of their descendants of mixed blood are to be found in one or two localities in Rhode Island.

NARRAGANSETT PIER, R. I., a famous summer resort, in Washington County, on Narragansett Bay, and on the Narragansett Pier Railroad, a connecting line with the New York, New Haven and Hartford Railroad, about 10 miles from Newport and 28 miles from Providence. The railroad was built in 1876 and extends from Kingston Station to the «The Pier,» a distance of about 12 miles. A steamer plies daily during the season between Newport and «The Pier.» The chief attractions are the climate and the scenery. Narragansett Heights, about three miles distant, are about 400 feet above sea-level and the colored rocks nearby and the long beach are attractive. There are a number of fine hotels, handsome cottages and excellent bathing houses and pavilions. The place was settled in 1675, and the same year an engagement took place nearby between the colonists and the Narragansett Indians. General Winslow, who commanded the colonists, about 1,000 in all, captured 600 Indians and killed 300. The loss of the whites was about 150 wounded and 85 killed. The pier, from which the place takes its name, was built in 1815. Pop. of town 1,500.

NARRATIVE POETRY. The telling of a story in verse is in modern times rather exceptional than normal, owing to the extraordinary rise in importance of prose fiction. But in early periods narrative poetry was the most abundant and important kind, owing to the primitive tendency to devote poetry largely to objective purposes, in contrast with the subjective tendency of modern poetry. For the various types, see under LITERARY FORMS.

The Ballad.— In general this is the most primitive type of narrative poetry, and is assumed to have existed among practically all peoples, though in many instances no early examples have survived. This proportionately large disappearance of early ballads is due to their belonging to the period of oral composition and transmission, as distinguished from that of written literature; and this oral element is the fundamental characteristic of the type. It is connected, too, with the element of song; for the primitive ballad may always be assumed to have been sung. A surviving evidence of this is the frequent appearance of a refrain, perhaps originally joined in by the whole company of persons present at the ballad singing. Closely connected with these characteristics is the *communal* spirit of the old ballad: the form arises from a state of society when the individual poet is of relatively slight importance and when the content of poetry is not the experiences and feelings of the individual singer but those of the group. Hence in the ballads we do not look for individuality of style; of this their universal anonymity is a sign. Their language is simple, unsophisticated, but conventional, marked by abundant repetition yet by rapidity of narrative method,— in a word, the language of an age, as Ten Brink put it, whose poetry is «oscillating perpetually between reminiscence and improvisation.» Very many of the ballads, if not all, had their origin in the versifying of a real fact, gathering up mythical elements in the manner of popular tradition. Often there are many different versions of the same story, some differing only in details, others in essential elements, such as changes from supernaturalism in the direction of realism, or variants characteristic of particular localities or social groups.

Of ancient ballads of Greece and Rome no remains survive, though evidence of their nature is thought to be traceable in elements of the ancient epics. Macaulay, in his ‹Lays of Ancient Rome,› made a brilliant but rather sophisticated attempt to conceive the matter and spirit of ballads of the early Roman people. Of the Latin races the Spanish branch has preserved the greatest number of ballads, some of those still extant dating from the early 11th century; most famous are those concerned with the story of «the Cid,» in the 12th century. Of French balladry the remains are more fragmentary. The early Germans are known to have made abundant use of ballads, and a collection of them was made under the direction of the Emperor Charlemagne; a surviving fragment of a «Hildebrand song» is supposed to date from the 8th century. Later, in the 15th and 16th centuries, a new era of German balladry developed; and toward the end of the 18th century modern scholars, led by Herder, began the systematic collection of the ballads of the race. There are also rich remains of the ballads of the Scandinavian peoples, dating from the 11th, 12th and 13th centuries; a collection was made in Denmark as early as 1591, while one of the greatest of modern ballad collections is that of the Danish scholar Grundtvig. The Slavic peoples have preserved an abundant ballad tradition, and some of them, notably the Serbians, are to this day in the ballad-making and ballad-singing period. Of the early English ballads no remains are preserved; but there are numerous survivals of the mediæval and modern periods of ballad-making, both in Scotland and England, beginning perhaps in the 13th century and extending as late as the 18th. The Robin Hood group includes the most famous of these, — a cycle thought to have originated in the 13th century. A monumental collection of the English and Scottish ballads was made by the American scholar F. J. Child.

The revived interest in balladry characteristic of the romantic movement in the late 18th century led to the writing of various modern adaptations and imitations, of which one of the most famous is the German poet Bürger's ballad of ‹Lenore,› which was translated by Walter Scott. Wordsworth and Coleridge also adapted the ballad form to two different types of narrative verse found in their volume of ‹Lyrical Ballads› (1798),— types represented respectively by Coleridge's ‹Ancient Mariner› and Wordsworth's ‹Lucy Gray.› Finally, one must note the distinction between these ballads which in one way or another hark back to the old folk poetry and the so-called ballad which is characteristic of the age of printing, and was abundantly produced, in doggerel verse, in the 16th and 17th centuries; these compositions, which are usually destitute of literary value, are sometimes called «broadside ballads,» from the most common form of their printing.

The Epic.— This type may be viewed as an elaboration of the ballad, developing similar material more formally and at greater length, and representing a state of society more highly organized, socially and politically. Frequently a definite racial or national spirit underlies the epic, its subject, as Hegel expressed it, being some action which «includes the whole life of a nation and the history of an epoch.» Like the primitive ballad, the primitive epic belongs to the period of oral transmission, but is associated with recitation rather than song, and with the art of professional entertainers, such as the German *scop* and the French *jongleur*. In some of the more elaborate ballads, notably the expanded ballad called ‘A Gest of Robin Hood,’ one may see something of the transition to epic elaboration and individual art-composition; and certainly when we reach the full epic form, though it is still representative of communal material and interests, we recognize the skill of highly developed individual workmanship, giving unity and form to great masses of material. It is customary to distinguish between the folk-epic, based originally on ballad tradition, and showing comparatively little of the spirit of the individual artist, and the art epic, consciously and imitatively developed by a poet of a literary age. Of the former the conventional example is the Greek ‘Iliad’ of Homer, dealing with the hero Achilles and the Trojan War; of the latter, the Roman ‘Æneid’ of Virgil. But the distinction cannot be maintained with accuracy, since there is indefinite gradation from the communal to the individual method. Thus the Greek ‘Odyssey,’ on the wanderings of Ulysses, which is traditionally attributed to the same poet as the ‘Iliad,’ shows far less of the national and communal, and more of the individual, spirit. Other epics of the more or less primitive type are the ‘Mahabharata’ of India, based on the mythologic legends of the Hindu people; the German stories of the ‘Nibelungen’ and ‘Gudrun,’ dating from the 13th century; the French *chansons de geste*, or heroic songs, abundant in the 11th and 12th centuries, of which the chief is the ‘Song of Roland’; the Spanish ‘Poem of the Cid,’ of the 12th century; and the old English ‘Beowulf,’ in its present form dating from the beginning of the 8th century, but representing an earlier period and Scandinavian rather than English matter. The old Norse lays of the ‘Elder Edda’ approximate epic form, but in unity and elaboration the prose ‘Saga of the Volsungs’ is nearest, for the Scandinavians, to the true epic. Epics half way, in a sense, between the primitive and the sophisticated type, are the Indian ‘Ramayana,’ the Persian ‘Shah-Nameh’ (made by the court poet Firdausi from primitive epic material), and the Finnish ‘Kalevala’ (compiled by the modern philologist Lönnrot). To the same hybrid class belong the partly compiled, partly composed Celtic «epics» of James Macpherson, ‘Fingal’ and ‘Temora’ (1762–63), based on more or less genuine materials from the Scottish Highlands, attributed to a traditional bard named Ossian.

The imitative or art epic has been well represented in every literature which came under the influence of the classical tradition. For Greece itself there was a considerable number of these poems, commonly called the «epic cycle,» whose authors undertook to complete the epic treatment of national material left untouched by Homer; and, in the Alexandrian age, the ‘Argonautica’ of Apollonius of Rhodes. For Rome, as we have seen, the great example is the ‘Æneid,’ which remains the most successful reproduction by art of the spirit of the folk epic; for Virgil celebrated a theme of national significance at the moment when the national life of the Romans was at its height. Later Roman epics were the ‘Pharsalia’ of Lucan and the ‘Thebais’ of Statius. In the mediæval period the epic form, like all literary forms, was turned to the service of the Church, and there was a considerable production of Christian epics, beginning with the ‘Historia Evangelica’ of Juvencus, in the 4th century. Highly characteristic, too, of this era are narrative poems of allegorical or symbolic type, having something of the dignity and elaboration of the epic but without its usual themes or methods; one may note examples as different as the great ‘Divine Comedy’ of Dante and the English poem of ‘Piers Plowman.’ The Renaissance was followed by various experiments in formal epic, such as the ‘Lusiad’ of Camoens in Spain (1572) and Tasso’s ‘Gerusallemme liberata’ (1581) in Italy. In the 18th century Voltaire attempted to revive the glory of the form in his ‘Henriade’ (1723). In Germany the most notable modern epic is Klopstock’s biblical ‘Messias’ (1773); there is also a 19th century version of the Nibelungen epic by Wilhelm Jordan. In England the Renaissance poets were rather less interested in the epic than those of the Continent, though Spenser doubtless regarded the allegorical narrative of his ‘Faery Queene’ (1590–96) as in the epic tradition; and the same thing is true of historical poems like Warner’s ‘Albion’s England’ (1586), Daniel’s ‘History of the Civil Wars’ (1595), and Drayton’s ‘Mortimeriados’ or ‘Barons’ Wars’ (1596, 1598). It was reserved for Milton to make the only really vital application to English poetry of the old epic method, in his ‘Paradise Lost’ (1667), a work dealing with the supreme conflict of the whole human race instead of a special branch of it. Cowley had already produced a biblical epic in the ‘Davideis’ (1656), and Davenant an historic epic in the ‘Gondibert’ (1651),—both highly praised in their time, but now considered unreadable. Equally lacking in vitality were the English epics of the 18th century, such as Blackmore’s ‘Alfred’ (1723); Glover’s ‘Leonidas’ (1737), and Wilkie’s ‘Epigoniad’ (1757); on the other hand the taste of this age for the epic form found expression in Pope’s famous translation of Homer. In the early 19th century the epic method was revived by Southey in a series designed to represent the great religions of the world: ‘Thalaba,’ ‘Madoc,’ ‘The Curse of Kehama,’ and ‘Roderick’ (1801–14). The taste of the modern period, however, turned very definitely either to romance or realism, both of which found expression in Byron’s great satiric-romantic-realistic epic of ‘Don Juan’ (1819–24). Something of the old epic method was again revived by Tennyson for his rather mysteriously termed ‘Idylls of the King’ (1859–85), and — with far more regard for the primitive tradition — by William Morris in ‘Sigurd the Volsung’ (1876). But the finest example in modern poetry of classical epic style is found in the episodical ‘Sohrab and Rustum’ of Matthew Arnold (1853),— a version of a brief portion of the Persian ‹Shah-Nameh.› Once more, at the opening of the 20th century, a vigorous effort has been made to revive the national epic, in the ‹Drake› of Alfred Noyes.

Finally, we may note that in every period there have been burlesque or satiric epics, taking their point from the very dignity of the traditional form in contrast with the triviality or meanness of its new application; such are the ancient Greek ‹Battle of the Frogs and Mice,› Butler's ‹Hudibras› (1662); Boileau's ‹Lutrin› (1674), and Pope's ‹Rape of the Lock› and ‹Dunciad› (1712 and 1728).

The Metrical Romance.— This type of narrative poem is especially characteristic of the mediæval period, or, more generally, of the age of chivalry as distinguished from that of primitive heroic life and literature. Between many of these poems, however, and the epic, the line is a very doubtful one. The greatest representatives of the type are found in Chrestien de Troyes, a *trouvère* of France in the late 12th century, and two German poets of the early 13th century, Gottfried of Strassburg and Wolfram of Eschenbach, of whom the former rewrote the story of Tristan and Isolde and the latter the story of Parsifal. But besides these, in every country of western Europe, there were uncounted nameless authors both of individual poems and of those which go to make up the great «cycles» like those of Arthur, Tristram, Gawain and other popular heroes. It is common to divide these romances according to the geographic source of their material, which is thus classified as «Matter of France,» «Matter ot Britain» (that is, the primitive Celtic region, whether continental or insular), «Matter of the Orient,» etc. But in the actual authorship and distribution of the romances, linguistic, racial and geographic lines play comparatively little part, a good portion of them having become the property of all the European peoples of their age. Like the epic, these romances represent the age of recited poetry and of professional entertainers; Scott's ‹Lay of the Last Minstrel› at once describes the type and exemplifies the way in which he came to pass from the study of the early romances to the writing of modern originals. In England the finest of the romances are as late as of the 14th century; notably, for the more popular sort, the ‹Sir Gawain and the Green Knight› of a genius whose name has been lost, and for the more literary, the ‹Troilus and Criseyde› of Chaucer, in which a familiar episode of the old Trojan war story is treated with an interest in characterization and in realistic humor which make it anticipatory of the modern novel. On the border, again, between the mediæval and the modern spirit was the popular Italian romance of the Renaissance, Ariosto's ‹Orlando Furioso› (1515). In the neo-classical period, especially the 18th century, this loose and unauthenticated type of poetry was naturally regarded with little favor, and for equally obvious reasons it was enthusiastically revived by the representatives of the «romantic revival.» In England the metrical romances of Scott, already referred to, were the most important results of the movement, especially ‹Marmion› and ‹The Lady of the Lake› (1808 and 1810). In the introduction to ‹The Bridal of Triermain,› Scott distinguished the form from epic poetry as being free from all rules save «those which good sense, good taste and good morals apply to every species of poetry.» In the later 19th century it was again revived by William Morris in various imitations of the work of mediæval romancers; while in Germany a notably successful specimen was Scheffel's ‹Trompeter von Säckingen› (1853).

The Tale, etc.— In all periods, and especially in modern times, narrative poetry tends to overrun the bounds of fixed types, and to appear in forms which may be vaguely called metrical tales or otherwise. In classical literature the most influential example of this form is the ‹Metamorphoses› of Ovid, whose material sifted down into a great part of mediæval and Renaissance poetry. In the mediæval period the supreme example is the ‹Canterbury Tales› of Chaucer, which drew upon every type of story material, combining sentiment and humor, realism and romance. In the Renaissance the Ovidian type of narrative poem is represented by Marlowe's ‹Hero and Leander› and Shakespeare's ‹Venus and Adonis› and ‹Lucrece.› Dryden's ‹Fables› (1700) are a landmark in another period, but are largely versions of tales by earlier poets. Like the metrical romance, the poetic tale was abundantly revived in the period of the romantic revival, sometimes with a view to the attainment of realistic simplicity, as in Wordsworth's ‹Michael› or (in Germany) Goethe's ‹Hermann and Dorothea,› sometimes with a preference for highly romantic elaboration, like ‹The Eve of Saint Agnes› of Keats. Byron's «tales,» nine in number, published between 1813 and 1823, went far to supplant the popularity of Scott's metrical romances, and in some cases might very well be called by that name themselves. Space does not permit the tracing of the varied development of the less defined types of narrative poetry through the 19th century. Perhaps the most remarkable experiment made in that period was Browning's ‹The Ring and the Book› (1868), in which a single story is told 10 times over, in a series of monologues supposed to be uttered by various persons concerned. Tennyson, on the other hand, told the story of ‹Maud› (1855) in a series of monologues and lyrics supposed to be uttered by a single person, forming a «monodrama.» Both these works are characteristic of the trend of narrative poetry in modern times, toward subjective and spiritual qualities, as opposed to the objectivity of the increasingly rare epic method. On the other hand, the early 20th century has seen some return to the more objective tale in the Elizabethan narratives of Alfred Noyes's ‹Tales of the Mermaid Tavern› and the realistic contemporary narratives of John Masefield, notably ‹Dauber.›

Bibliography.— For the nature and development of the more primitive types of narrative poetry, consult Gummere's ‹The Beginnings of Poetry› (New York 1901) and ‹The Popular Ballad› (Boston 1907); Ker's ‹Epic and Romance› (London 1897); Hart's ‹Ballad and Epic› (Harvard Studies and Notes, Boston 1907); Saintsbury's ‹The Flourishing of Romance and the Rise of Allegory› (London 1897); Billings's ‹Guide to the Middle English Metrical Romances› (New York 1901); Schofield's ‹English Literature from the Norman Conquest to Chaucer› (New York 1906); the introductions to the translations of ‹Beowulf›

and the ‹Song of Roland› in the ‹Riverside Literature Series› (Boston); and the volume of ‹Arthurian Chronicles› in ‹Everyman's Library.› On the Greek epic, consult Lang's ‹Homer and the Epic›; on epic poetry in general, Dryden's Preface to his translation of Virgil and Clark's ‹History of Epic Poetry› (Edinburgh 1900); on English narrative poetry, Dixon's ‹English Epic and Heroic Poetry› (London 1912).

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NARRENSCHIFF, när'ĕn-shĭf, **Das** (‹The Ship of Fools›), Sebastian Brant's celebrated work (1494). See BRANT, SEBASTIAN.

NARROWS. See TRELLISED DRAINAGE and STREAM PIRACY.

NARROWS, The, a narrow part of New York Bay, a channel which connects Upper New York Bay with Lower New York Bay, and separates Long Island and Staten Island. At the south entrance of The Narrows are two forts, Fort Hamilton on Long Island and Fort Wadsworth on Staten Island. See map of Greater New York and vicinity under NEW YORK.

NARSES, när'sēz, Byzantine general: b. Armenia, 472; d. Rome, 568. He was a eunuch when he entered the imperial household in Constantinople, of which he soon became chamberlain. His ability soon advanced him to the office of treasurer to Justinian, who sent him to Italy in 538 to keep an eye on Belisarius. Narses was recalled in 539 and in 551 succeeded Belisarius as commander-in-chief in Italy and speedily drove thence the Franks and Goths, and re-established Byzantine control. He took possession of Rome and was appointed prefect of Italy in 554. In spite of his able administration he was removed by Justinian's successor, Justin II, on the ground of his avarice which caused him to levy severe taxes on the people. Legend says that he was insulted by the Empress Sophia upon his dismissal, and that he thereupon went over to the Lombards. He was equally famous as general and statesman. Consult Hodgkin, ‹Italy and Her Invaders› (1885–95, Vols. IV and V); Bury, ‹Later Roman Empire› (Vol. I, 1889); Gibbon, E., ‹Decline and Fall of the Roman Empire› (London 1898); ‹Cambridge Mediæval History› (Vol. II, New York 1913).

NARTHEX (Greek, a reed, hence any oblong figure), the term used in ecclesiastical architecture to designate the westernmost division of an ancient Greek church, running like a cloister from the north to the south wall. It was a vestibule, separated from the nave proper by a screen or railing, beyond which catechumens and those under Church censure or penance were not permitted to advance. It had three door-ways, one on the west as well as one in the northern and southern walls. The western was the principal entrance and was known as «the beautiful» or «royal gate.» The doors leading through the screen into the nave were named according to the classes who used them, «the priests' gate,» «the men's gate,» etc. The narthex was also used for funerals and public meetings; baptism was celebrated there and the font, which had formerly been in a building adjoining the church, was also placed in the narthex. There was sometimes an inner and an outer narthex. Consult Bingham, ‹Christian Antiquities›; Siegel, ‹Christliche Alterthümer›; Walcott, ‹Sacred Archæology.›

NARUSZEWICZ, nä-roo-shā'vĭch, **Adam Stanislaw**, Polish historian and poet: b. Pinsk, Lithuania, 20 Oct. 1733; d. Janow, Galicia, 8 July 1796. He became a Jesuit in 1748; taught in the Jesuit schools in Vilna and Warsaw; and after the suppression of the Order became bishop of Smolensk, and later of Lutsk. His poetry, consisting of translations, odes, fables, epigrams, satires and idylls, was first published in 1778. In prose, he translated Tacitus, wrote a biography of Chodkiewicz (1781), composed a history of Crimea (1787), and on the suggestion of his patron, King Stanislaus Augustus Poniatowski, wrote his greatest work, a history of Poland down to 1386 (1780–86, new ed. 1859–60), which, because of its style and its protest against the abuses of a monarchy or an aristocracy, won him the name of the Polish Tacitus.

NARVA, när'va, Esthonia, an important manufacturing town on the river Naróva, 100 miles southwest of Petrograd. It contains several Greek and Lutheran churches, has a fine town-hall, a castle, two gymnasia, a theatre and technical schools in connection with the cotton and woolen mills nearby. Cotton and lumber are the principal items of trade. The town was founded by the Danes in the 13th century, and after being held briefly by the Russians passed to the Swedes in 1581. Peter the Great took it in 1704. Here, on 30 Nov. 1700, was fought a battle between 8,000 Swedes under Charles XII and 80,000 Russians under General Dolgorouki. The Russians were besieging Narva, and after driving in 10 large bodies who occupied advanced positions, Charles boldly attacked their entrenched camp. After a brief cannonade the Swedes stormed the Russian trenches, and although the Russian artillery stood to their guns, the defenders were driven out in disorder after three hours of hard fighting. The Russians lost 18,000 men in the trenches and many more in the open fight; the Swedes only lost 600. Pop. 35,000, Germans, Esths and Russians.

NARVACAN, när-vä-kän', a pueblo of the province of Ilocos Sur, Luzon, situated 13 miles southeast of Vigan, the provincial capital. It is on the main road and one of the most important towns of the province, being next the capital in population. Pop. 19,500.

NARVAEZ, när-vä-ĕth', **Pánfilo de**, Spanish soldier in America: b. Valladolid, about 1470; d. near mouth of Mississippi River, November 1528. He came to America about 1498, settled first in Santo Domingo and then in Cuba, where from 1512 until his death he was under Velasquez in the command of an auxiliary force in the conquest of the island. The disobedience of Cortés in Mexico, whither he had been sent by Velasquez, led the latter to send Narvaez in 1520 to supersede and punish Cortés. This expedition was entirely unsuccessful. Narvaez landed at Vera Cruz in April; was defeated in May at Cempoala by the army of Cortés; lost one eye in the battle, and was deserted by the remnant of his army, which joined Cortés. He was captured, but soon released; returned to Spain, where he was appointed governor of Florida in 1526, and sailing from Cuba in March of 1528, landed at Apalachee Bay, lost half his men on the march inland, retreated to the shore, where he found that his ships had been destroyed, and having built boats, sailed westward along the coast, only to be shipwrecked with all but four of his men. Consult Bourne, E. G., 'Spain in America' (New York 1907); Alvar Níeñez Cabeza de Vaca, 'Relación' (in J. F. Jameson's, ed., 'Original Narratives of Early American History' (Vol. II, ib. 1907).

NARVÁEZ, Ramón María, DUKE OF VALENCIA, Spanish general, and statesman: b. Loja, Andalusia, 4 Aug. 1800; d. Madrid, 23 April 1868. He entered the army in 1815; fought against the French and in 1822 assisted in putting down the uprising in the Royal Guards; lived in retirement at Loja from 1823 until the death of Ferdinand VII in 1833; in 1836 defeated the Carlist leader, Gomez; and in 1838, after clearing La Mancha of brigands, was made captain-general of Old Castile. He led an insurrection against Espartero, in 1840, his old chief, but was beaten and fled to France, where he joined the party of Maria Christina. He returned to Madrid in July 1843; Espartero left the country; and from May 1844 to February 1846, and from October 1847 to January 1851 Narvaez was Prime Minister, in recognition of his services to Maria Christina. In 1845 he was made grandee of Spain of the first class and Duke of Valencia. He began by changing his policies to the more conservative form, revising the Liberal constitution of 1837. He held the same post in 1856–57 and 1864–65, being Minister to Paris and Vienna in the intervals. During the military rising of 22 June 1866 Narvaez commanded the loyal soldiery, and in July succeeded the defeated O'Donnel as Ministry President and Minister of War. A Liberal in early life he became more and more conservative and spent his last years in attempting to keep Isabella on the throne. Consult Mazade, 'Les révolutions d'Espagne' (Paris 1869); Pirala, A., 'Historia contemporánea' (Madrid 1871–79).

NARVIK, när'vĭk, Norway, small town on the Ofoten Fjord, with beautiful mountainous surroundings. It is also known as Victoriahavn, and is the terminus of the Ofoten Railway which transports an enormous tonnage of Swedish iron ore. It is used by the tourists visiting the lovely Lofoten Islands. It is a station for coastwise trading steamers. Pop. about 4,643.

NARWHAL, a large porpoise which inhabits the Arctic Ocean. It belongs to the family *Delphinidæ* and was named *Monodon monoceros* by Linnæus. Its most striking characteristic is the possession by the male of a very long, straight, spirally-grooved tusk, which projects forward from the left side of the upper jaw in line with the axis of the body. When full-grown the narwhal has a length of about 16 feet. The head is rounded, the back has a very low ridge instead of a fin and the pectoral fins are short and broad. The color of the body is gray above and white below, everywhere mottled and spotted with gray and black. The young are darker colored, while old individuals are often nearly white throughout. The vertebral formula is as follows: Cervicals, 7; dorsals, 11; lumbars, 6; caudals, 26; total, 50. The cervical vertebræ, unlike those of other true porpoises, except the beluga or white whale, are all free. The skull is depressed, with a broad rostrum.

The massive tusk or maxillary tooth of the narwhal is developed only in the male, and with rare exceptions, only on the left side of the jaw. Normally the corresponding tusk or tooth of the right side remains concealed in the maxillary bone during life. In females neither tusk is visible. All other teeth are wanting in adults of both sexes. Occasionally, both tusks are developed in males and in females as well. About 16 such heads have been preserved, including one from Prince Regent Inlet, in the National Museum, Washington. The largest narwhal tusks are about eight feet long, with a girth of about nine inches at the base. They are hollow for a considerable proportion of their length.

The tusk is a secondary sexual character like the antlers of the stag, the spurs and comb of the cock, etc. It has been suggested that the narwhal makes use of the tusk to break the ice, to transfix its prey, or in combat, but these ideas lack confirmation.

When first introduced into Europe, the true origin of the tusks not being known, they were supposed to be the horns of the mythical unicorn. For a considerable time they were highly prized on account of their reputed medicinal properties, and are still made use of in China as a drug.

Narwhals occur in large herds or schools among the ice of the Arctic Ocean, northward of lat. 65° N. They migrate to higher latitudes as the ice recedes and return in the fall. Very rarely individuals stray southward along the coast of Europe as far as Scotland.

The narwhal resembles the beluga or white whale in many important characters, not shared by other porpoises, and forms with it a separate sub-family, the *Delphinapterinæ*.

NASBY, năz'bĭ, **Petroleum V.** See LOCKE, DAVID ROSS.

NASCENT STATE, *in chemistry,* the state or the peculiar reactionary power possessed by an element at the instant of liberation from a compound or combination in which it has previously existed. At the moment an element is liberated from a compound of which it has been a constituent it acquires a higher power of chemical reaction than it displays some time after its liberation. One theory of the nascent state of an element is that the molecules at the instant of liberation are separate and independent; and that an appreciable length of time is required for their final arrangement; and that while they are in this free state they possess an extraordinary power of reaction, which power is otherwise exerted and expended in the act of molecular arrangement. For instance, it has been advanced by some chemists and physicists that hydrogen in a nascent state is made up of single atoms, while hydrogen in a gaseous state is composed of molecules, each molecule containing two atoms. Another theory is that nascent hydrogen is simply hydrogen under great pressure, for a mere increase in pressure will make ordinary hydrogen act like nascent hydrogen. Thus many substances, such as aldehyde, will combine with nascent hydrogen which utterly refuses gaeous hydrogen.

NASCOPI (nä-skō'pē) or **NASCAPEE. INDIANS,** a Labrador tribe, the most northeasterly known branch of the Algonquian family. They formerly occupied the interior table-land extending from Lake Mistassini to the Atlantic Ocean.

NASEBERRY, the fruit of *Sapota achras,* one of the finest West India fruits. The bark of the tree has astringent and febrifugal properties. See SAPOTACEÆ.

NASEBY, nāz'bĭ, England, a village of Northamptonshire, 12 miles northwest of Northampton (pop. 456), on the north side of which, on 14 June 1645, Fairfax and Cromwell, commanding the Parliamentary troops, defeated Charles I and his army, taking 5,000 prisoners and capturing the royal cannon and baggage. An obelisk marks the site. Pop. about 700.

NASH, Abner, American politician: b. Prince Edward County, Va., 8 Aug. 1716; d. Philadelphia, Pa., 2 Dec. 1786. He studied law and removed to New Berne, N. C., where he practised successfully and in 1774 he was a member of the first provincial congress of North Carolina. He served as member of the council which framed the State constitution in 1776 and was speaker of the senate in 1779. He was governor of the State from 1779–81 and in 1782–86 sat in the Continental Congress.

NASH, Francis, American soldier: b. Prince Edward County, Va., 10 May 1720; d. Germantown, Pa., 7 Oct. 1777. He was a brother of Abner Nash (q.v.), and early removed to North Carolina, where he was clerk of the Superior Court of Orange County. He was a member of the assembly in 1771, 1773–75. He served under the Crown with a captain's commission, but resigned and was a member of the provincial congress which met in 1775 when he was appointed lieutenant-colonel in the Continental army. In 1777 he was commissioned brigadier-general by the Continental Congress and at once joined Washington, under whom he commanded a brigade and was mortally wounded at the battle of Germantown.

NASH, George Kilburn, American politician: b. York Township, Medina County, Ohio, 14 Aug. 1842; d. 28 Oct. 1904. A descendant of Thomas Nash, he was educated at Reserve University and at Oberlin College (1862–64), studied law and was admitted to the bar in 1867. He was editor of the *Ohio State Journal,* and in 1879–82 was prosecuting attorney of Franklin County, Ohio. He established a law practice in Columbus in 1883–85. In 1880–83 he was attorney-general of Ohio and in 1883–85 served as member of the State Supreme Court commission. In 1880–81 and 1897 he was chairman of the Republican executive committee. In 1899 he was nominated for governor, was elected in November of that year and re-elected in 1901, his second term expiring in January 1904.

NASH, SIR **John,** English architect: b. London, 1752; d. East Cowes Castle, Isle of Wight, 13 May 1835. He studied and practised architecture under Sir Robert Taylor; then retired from business until 1793; and upon his re-entry into the profession gained much royal and noble patronage. He laid out Regent's Park and the street leading up to the park, now called Regent street; remodeled Buckingham Palace and altered the Brighton Pavilion. He was particularly fond of single façades, of projecting colonnades and of a plentiful use of plaster and stucco. The use of cast-iron girders was principally introduced by Nash, who patented several varieties. Personally he was an estimable man, but unpopular because of George IV's display of favoritism toward him.

NASH, Richard, called BEAU NASH, English leader of fashion: b. Swansea, Wales, 18 Oct. 1674; d. 3 Feb. 1762. He studied at Jesus College, Oxford, was for a time in the army, but finding military discipline not to his liking, entered at the Inner Temple. In 1705 his skill in gaming took him to Bath, which in 1703 had become a much frequented watering-place. He determined to improve the provincial character of the spa, and soon became a self-appointed but arbitrary master of ceremonies. He was known as the «King of Bath» and his rule was celebrated in prose and verse. His code included the prohibition of swords within his realm, a restriction which tended toward that consideration for the public peace which was then growing in England. His vanity grew with his power; he appeared in a monstrous cream-colored beaver and invariably journeyed by post-chariot with three span of grays, footmen and outriders. Gambling was prohibited by law in 1740, and Nash, by 1745, had lost his trade. The town granted him an annuity of £10 a month. Goldsmith wrote his life (1762). Consult also Jerrold, C., ‹Beaux and the Dandies› (New York 1910).

NASH, or **NASHE, Thomas,** English satirist and dramatist: b. Lowestoft, Suffolk, 1567; d. 1601. He studied at Cambridge in 1586, spent some time on the Continent, and before 1588 came to London. In 1589 he published his ‹Anatomie of Absurditie.› In the literary warfare carried on between the Puritans and bishops Nash took an active part in behalf of the latter. Under the pseudonym «PASQUIL» he published the tracts ‹A Countercuffe Given to Martin Junior› (1589) and ‹Pasquil's Apologie› (1590). In 1592 he issued his powerful satire on contemporary society, ‹Pierce Pennilesse his Supplication to the Divell.› His ‹Christes Teares over Jerusalem› (1593) followed in repentant mood, and he affected to dismiss satire, in which, he said, he had «prodigally conspired against good houres.» His notable work of picaresque fiction, ‹The Unfortunate Traveller, or the Life of Jack Wilton› (1594) to a certain extent anticipated Defoe. Involved in a paper war with Gabriel Harvey, who had boasted of having put him to silence, he thereupon published ‹Have with you to Saffron-Walden, or Gabriel Harvey's Hunt is Up› (1596), brimming with scorn. Nash also wrote plays, in whole or in part. He completed, unsatisfactorily (1594), Marlowe's ‹Dido.› His ‹Summers' Last Will and Testament› (1593), comedy, was first published in 1600. A play, ‹The Isle of Dogs,› led to his imprisonment for attacks contained in it. He died having, as one epitaph put it, «never in his life paid shoemaker or tailor.» Nash's personality was somewhat unique in Elizabethan literature. His prose was vigorous and his verses were at times those of a poet. His works were edited by Grosart (1883–85).

NASHUA, năsh'ū-ạ, N. H., city, one of the county-seats of Hillsboro County, on the Nashua River and on several branches of the Boston and Maine Railroad, about 33 miles south by east of Concord and 38 miles northwest of Boston. The first settlement was made in 1655 and in 1673 it was incorporated by Massachusetts as Dunstable township. In 1746 it was reincorporated by Massachusetts, and in 1836 it adopted the name Nashua. It received its city charter in 1853. It is an important manufacturing city; the water power is obtained from the Nashua River by means of a canal three miles long; 60 feet wide and eight feet deep. The chief manufactures are cotton goods, paper, shoes, iron and steel products, edge tools, hardware, saddlery, refrigerators, registers, sash, doors and blinds, ice-cream freezers, stationary engines, caskets and furniture. It has a United States fish hatchery, city and county buildings and several fine church buildings; Saint Francis Xavier (R. C.) is the largest. There are excellent public and parish schools and two academies. A new charter which provides for a mayor and 15 aldermen has been in force since 1913 and is working well. City elections are held entirely separate from State and national elections. The school board is chosen by popular vote. Pop. 26,000.

NASHVILLE, Ill., city, county-seat of Washington County, on the Illinois Southern and the Louisville and Nashville railroads, about 110 miles south by east of Springfield. It is in an agricultural region, in which there are large coal fields. The chief manufactures are flour, dairy products and agricultural and mining implements. Coal mining and cattle raising contribute to the industrial wealth of the city. Pop. 2,209.

NASHVILLE, Tenn., capital of Tennessee, the second largest city in the State, and county-seat of Davidson County, 186 miles southwest of Louisville, Ky., and 234 miles northeast of Memphis. Nashville is on the Cumberland River and the Nashville, Chattanooga and Saint Louis, Louisville and Nashville and Tennessee Central railroads.

Topography.— The city has an area of 18.2 square miles and is regularly laid out on gradually rising ground, sloping back from the river to an elevation of 654 feet above the sea. The streets are wide and well paved, about 242 miles of thoroughfare being covered with macadam and about 39 miles paved with granite, brick and bitulithic pavement. Around the city in every direction are the green hills of Middle Tennessee, where there is much commercial timber and mineral wealth. The soil in the vicinity produces every fruit and vegetable not absolutely confined to the tropics. The average rainfall for 31 years has been 48.82 inches; the average winter temperature 39° and summer temperature 79°; mean temperature for the year 59°.

Government.— Nashville has a commission form of government, of five commissioners, of whom the mayor, commissioner of police and public welfare is chairman. The other commissioners are commissioner of finance and street lighting; commissioner of streets, paving and sewers; commissioner of waterworks, street sprinkling and alleys; commissioner of fire and buildings. The various other officers are elected by the city commissioners, who also serve as a board of civil service commissioners; the vacancies on the park commission, however, are filled by the surviving members of that commission which is self-perpetuating. The city expends annually $2,000,000 for maintenance; the principal items being $467,000 for schools; $2,000 for interest on debt; $213,000 for police department and $230,000 for waterworks. The waterworks are owned by the city; the system which comprises 200 miles of mains cost over $2,000,000. The electric lighting plant is also owned by the municipality. Over $1,000,000 has been expended in recent years on a new and improved sewer system. The street railways operate over 95 miles of track, all converging at a central transfer station.

Buildings.— Prominent among the noticeable structures are the State capitol, costing $1,500,000; United States Government building; Davidson County court house; the city hall; Tennessee School for the Blind; Tennessee Industrial School; the State penitentiary; the Parthenon; city hospital; Confederate Soldiers Home; Vendome Theatre; the Union depot; Hermitage hotel; Stahlman building; Independent Life building and the various churches and educational institutions.

Education.— There is no city in the South as prominent in educational interests as Nashville. Here is the seat of the Vanderbilt University; the University of Nashville; George Peabody College for Teachers; Ward-Belmont College; Boscobel College; Watkins Institute; Buford College; Nashville Bible School and many others; Saint Cecilia Academy; Fisk University; Roger Williams University; Walden University. The State Library contains 40,000 volumes. The Carnegie Library cost $100,000 and has a fine rapidly increasing number of volumes. The Tennessee Historical Society has a large and valuable library, many rare manuscripts, portraits, etc. The public schools are of the highest rank: and embrace, in additioin to the ordinary studies ranging into the high school education, departments of industrial education, stenography, typewriting, bookkeeping.

Parks and Cemeteries.— Nashville has 480 acres in parks. In the park surrounding the State capitol building is the tomb of James K. Polk (q.v.) and an esquestrian statue of Andrew Jackson. The Hermitage, the former home of Jackson, is 10 miles east of the city. To the north is the National Cemetery where are buried 16,643 soldiers who fell in the Civil War. A Centennial Park has been made on the grounds of the Tennessee Centennial Exposition of 1897, and the former history building is now a museum and art gallery. In the park is a fine monument honoring James Robertson, the founder of Nashville. Watkins Park is to the west. Shelby Park, to the east of the city, is a natural shaded tract with a river frontage. Glendale Park, to the south, is a place of unrivaled beauty. There is also here

Mount Olivet Cemetery, with the beautiful Confederate soldiers' monument, and the Cumberland Driving Park.

Manufactures.—The industries of Nashville, which are more extensive than any other city in the State, had in 1919 aggregate capital of $115,000,000, and manufactured products valued at $150,000,000. The manufactures include flour, grist-mill products, lumber and timber products, fertilizers, cotton goods, clothing, harness, saddlery, soap, stoves, ranges, hollow ware, coffins, shoes, candles, tobacco, wagons, carriages, confectionery, printing, clothing and cars. There is a large export trade and extensive wholesale traffic in drygoods, boots and shoes, groceries, drugs, hats millinery, paper and hardware. The wholesale trade is estimated at over $250,000,000 annually. Almost at the doors of Nashville, and tapped by every line of railroad entering the city, are apparently inexhaustible fields of coal of the highest grade. The bountifulness of the supply is attested by the fact that during the prolonged anthracite coal strike, when coal was selling at almost prohibitive prices in every other section of the country, there was no advance in the price of coal in Nashville.

History.— The city was settled in 1780 by a band of pioneers under the leadership of James Robertson. It was named in honor of Gen. Francis Nash, a distinguished officer in the Revolutionary War, and was called Nashborough until 1784. During the early years of its existence Nashville was repeatedly attacked by the Cherokees and other Indian tribes. It was chartered as a city in 1806; was the seat of the State legislature in 1812–15, and became the permanent State capital in 1843. The Federal army occupied the city in 1862 and around the city in 1864 was fought one of the greatest battles of the Civil War. (See NASHVILLE, BATTLE OF.) In 1896 the State celebrated the centennial of Tennessee's admittance into the Union, and a great industrial exposition was held here the following year.

Population.— Nashville in 1830 had a population of 5,566; (1850) 10,165; (1860) 16,988; (1870) 25,865; (1880) 43,350; (1890) 76,168; (1900) 80,865; (1910) 110,364; the 1910 total included 2,993 persons of foreign birth and 36,523 of negro descent; (1920) 118,342.

WILL R. MANIER,
Secretary, Commercial Club of Nashville.

NASHVILLE, the name of a Confederate privateer that left Charleston in 1861 on a cruise to England and captured booty to the amount of $3,000,000. In March 1863 she was sunk by a Federal ironclad in the Savannah River.

NASHVILLE, Campaign and Battle of. When General Sherman's picked army of 62,000 left Atlanta 15 Nov. 1864 for the March to the Sea, the Confederate army under Hood, strengthened by Forrest's cavalry, was on the Tennessee River in the vicinity of Tuscumbia and Decatur, with S. D. Lee's corps across the river and in advance of Florence. Active preparations were making for a move on Nashville with the Ohio as a possible objective. General Thomas had been sent to Nashville six weeks before to organize a force to resist Hood. Toward the last of October the Twenty-third corps, Schofield's, and the Fourth, D. S. Stanley's, were ordered to Thomas, who sent them under General Schofield to Pulaski, with orders to delay Hood as long as possible to allow of the needed concentration and organization at Nashville. This infantry force at Pulaski aggregated 18,000 effectives, one division of the Twenty-third corps being detached, and was further strengthened by four brigades of cavalry under Gen. James H. Wilson. Forrest's force of Confederate cavalry was four times Wilson's. General Sherman thus describes the force with General Thomas at Nashville at the time of Hood's advance on Pulaski: «General Thomas was at Nashville with Wilson's dismounted cavalry, and a mass of new troops and quartermaster's employees amply sufficient to defend the place.» Of the sound men sent back to Thomas by General Sherman when he was fitting out a perfect army for the March to the Sea, he lost 15,000 from expiration of service, or from furloughs previously granted, within a week after Hood's advance from Florence. In place of these 15,000 Thomas received 12,000 newly enlisted recruits. To secure Chattanooga Sherman telegraphed General Steedman, who held the place with a small force: «You must organize and systematize the hospitals and men sent back to Chattanooga»; and to a suggestion that he might make use of some of the convalescents he was receiving from Atlanta he replied: «So far, all such detachments reported from the front are with furloughs and are awaiting transportation home.»

Under such conditions General Thomas was working most energetically at Nashville to organize an army to meet Hood, while General Schofield, with his inferior force, was holding against him with the utmost stubbornness to gain time for Thomas.

Hood was baffled in his attempt to intercept General Schofield at Pulaski and Columbia, Schofield reaching the latter place, forming solidly before Hood, who arrived 27 November, and holding him there to the limits of possibility. Again, by skilful work, Schofield reached Franklin in advance of Hood, marching his troops at night within rifle-shot of the enemy's lines at Spring Hill. Here Hood threw his army *en masse* upon Schofield, who had taken position around the town. The attack was delivered at 4 P.M., and lasted into the night. It was one of the most desperate assaults of the Confederates on any field, and most depressing for them in its results, five general officers being killed, six wounded and one captured. (See FRANKLIN, BATTLE OF.) The night of the 30th Schofield withdrew to Nashville, and the morning of 1 December Thomas' army was united.

A part of A. J. Smith's veteran division arrived at Nashville during the battle of Franklin, but not in time to be sent to General Schofield. The rest of his division, and General Steedman's division from Chattanooga also arrived 1 December.

Hood advanced the day after the battle of Franklin and established his lines in front of Nashville 2 December. Not until Hood appeared before Columbia with the entire army that had confronted the three armies under Sherman, re-enforced with Forrest's 10,000 cavalry, and the fact appeared that Schofield was fighting a gallant, almost desperate game to

NASHVILLE, TENN.

1 Jackson Monument

2 Vanderbilt University, Science Hall

hold him back while Thomas was working energetically to organize his forces, did the authorities at Washington and City Point realize that Thomas had been left with wholly inadequate means. In reply to a telegram from General Grant in which he was directed not to «let Forrest get off without punishment,» General Thomas, 24 November, thus stated his real condition.

> Your despatch of 4 P. M. yesterday just received. Hood's entire army is in front of Columbia, and so greatly outnumbers mine at this time that I am compelled to act on the defensive. None of General Smith's troops have arrived yet, although they embarked at Saint Louis on Tuesday last. The transportation of Generals Hatch's and Grierson's cavalry was ordered by General Washburn I am told, to be turned in at Memphis, which has crippled the only cavalry I had at this time. All of my cavalry was dismounted to furnish horses to Kilpatrick's division, which went with General Sherman. My dismounted cavalry is now detained at Louisville, awaiting arms and horses. Horses are arriving slowly, and arms have been detained somewhere en route for more than a month. General Grierson has been delayed by conflicting orders in Kansas, and from Memphis, and it is impossible to say when he will reach here. Since being placed in charge of affairs in Tennessee, I have lost nearly fifteen thousand men discharged by expiration of service and permitted to go home to vote. My gain is probably twelve thousand perfectly raw troops. Therefore, as the enemy so greatly outnumbers me, both in infantry and cavalry, I am compelled for the present to act on the defensive. The moment I can get my cavalry, I will march against Hood, and if Forrest can be reached he shall be punished.

This created a feeling at Washington and City Point approaching a panic. It was feared that Hood might avoid Thomas, cross the Cumberland and carry out President Davis' plan to have him push on to the Ohio. This fear was redoubled when the necessity appeared for Schofield to retire from Franklin. It was not so clearly seen that his stubborn holding against Hood had saved the situation which Sherman created. Instead of leaving Thomas, who up to that time had never lost a movement or a battle, to deal with Hood as his full knowledge of the situation might suggest, it was insisted that he should at once attack. The straits of the situation were recognized at City Point, and the day after Schofield's arrival Grant telegraphed: «Arm and put in your trenches your quartermaster's employees, citizens, etc.» The fourth day Thomas was peremptorily ordered to attack. He camly went on with his energetic preparations to deal a final blow to Hood. His despatches, clearly showing his situation and his active work, were ridiculed by Stanton and Halleck, and Grant repeated his orders to attack, and next directed Halleck to relieve him, first with Schofield, and next with Logan, and Grant himself started to take general direction, although Thomas had explained that while he had the troops ready to attack, a sleet-storm had covered the country with a sheet of ice upon which neither men nor horses could move, but that the moment it melted he would attack. When Logan reached Louisville he was met with the news of an overwhelming victory.

The two-days' battle, 15 and 16 December, was remarkable for its perfection of plan, and for the fact that in its progress to the end this plan was closely followed.

The Confederate main and advanced lines were intrenched on bold hills about two miles from the city. Their advanced salient was established within three-eighths of a mile of the Union centre. The Union lines extended from the river above the city to the river below it. The Confederate lines were compact between the Murfreesboro Railroad at their right and the Hillsborough Turnpike, which ran south from the centre of the city, across the Union centre. Thus the Confederate lines covered less than half of the Union position. Cheatham's corps was on the right, Lee's corps formed the centre, and Stewart's corps the left.

More than half the inner line was held by quartermasters' employees under Quartermaster-General Donaldson, and the rest of that line by new troops under Gen. J. F. Miller. Gen. A. J. Smith's corps held the right of the advanced Union line, Gen. T. J. Wood's line the centre and General Schofield the left. General Steedman's division was in echelon to the front on the left. The night before the battle General Schofield's corps was moved to the left and front of Wood's line, and prepared to take prominent part in turning the Confederate left. The morning of the 15th fog veiled the rapid formation of Union forces in front of their works.

The battle began at 8 o'clock by a successful attack by General Steedman's division upon the earthworks commanding the extreme left. This attracted the enemy's attention to that quarter. About 10 o'clock Smith's corps moved against Hood's left, and Wilson's cavalry corps of 9,000 horsemen and 3,500 dismounted men swung off in its wide circuit against the left and rear of the Confederate works, one division extending to the river below the city, and forcing back Hood's cavalry reserve under General Chalmers. Forrest's main body had been sent to attack Murfreesboro. Smith's corps moved obliquely against the Confederate left flank and took it in reverse. Schofield by a wide detour, penetrated still further to the rear. At the same time Wood assaulted in front. Wilson's troopers carried earthworks, captured 27 guns and swept squarely into the rear of the Confederate left. These movements compelled its withdrawal for two miles. The next afternoon the same tactics were continued by Smith, Schofield and Wilson, while Wood on the Union centre, and Steedman on the left, pushed forward to Hood's new line. This had been reformed with Cheatham on the left, Stewart in the centre and Lee on the right. The Union lines began the attack upon Hood's position at 3 o'clock with an unsuccessful assault by two brigades from Wood and one from Steedman upon the Confederate right. Soon after 4 o'clock Smith and Wood's corps on the front, with Schofield operating on their right and against the Confederate left flank, attacked in force, soon carrying the entire line. This attack and its results General Hood thus described in his official report: «The position gained by the enemy being such as to enfilade our line caused in a few moments our entire line to give way, and our troops to retreat down the pike in the direction of Franklin, most of them, I regret to say, in great confusion, all efforts to reform them being fruitless.» Here 54 guns in position were captured. There was immediate and hot pursuit for nine days, led by Wilson's cavalry, when the remnant of Hood's forces crossed the Tennessee, having suffered a loss during his campaign of over 13,500 prisoners and 72 guns, and here the Union pursuit ended. Over 2,000 deserters came into the Union lines.

The result vindicated Thomas' insisting upon waiting for the remounting of his cavalry, since Wilson with his troopers formed an essential and controlling element in the battle and in a pursuit which were designed to disintegrate an army.

The records do not show the number of men with which Hood reached Tupelo. He claims that there were 18,500 left there after 3,000 were furloughed. He further says that of 14,000 that left Tupelo to join Gen. J. E. Johnston in North Carolina 9,000 deserted. General Johnston's reports show that when Hood's forces reached him they numbered 3,953 officers and men. Thus, after Nashville, Hood's splendid force of Confederate fighters did not again appear as an army on the theatre of war.

Even this complete victory, defeating the contemplated advance of the Confederate army to the Ohio, did not fully allay the panic at Washington lest Sherman's movement to the sea should prove to have left the Central West without sufficient protection, and while every possible effort in pursuit was being put forth in horrible weather, General Halleck thus telegraphed Thomas:

> Permit me, General, to urge the vast importance of a hot pursuit of Hood's army. Every possible sacrifice should be made, and your men for a few days will submit to any hardships and privations to accomplish the great result. If you can capture or destroy Hood's army General Sherman can entirely crush out the rebel military force in all the Southern States. He begins a new campaign about the first of January, which will have the most important results if Hood's army can now be used up. A most vigorous pursuit on your part is, therefore, of vital importance to General Sherman's plans. No sacrifice must be spared to obtain so important a result.

General Thomas, nagged beyond endurance, put an end to this style of despatches by the following reply:

> Your despatch of 12 M., this day, is received. General Hood's army is being pursued as rapidly and as vigorously as it is possible for one army to pursue another. We can not control the elements, and you must remember that, to resist Hood's advance into Tennessee, I had to reorganize and almost thoroughly equip the force now under my command. I fought the battle of the 15th and 16th instant with the troops but partially equipped; and, notwithstanding the inclemency of the weather and the partial equipment, have been enabled to drive the enemy beyond Duck River, crossing two streams with my troops, and driving the enemy from position to position without the aid of pontoons, and with but little transportation to bring up supplies of provisions and ammunition. I am doing all in my power to crush Hood's army, and, if it be possible, will destroy it. But pursuing an enemy through an exhausted country, over mud roads completely sogged with heavy rains, is no child's play, and can not be accomplished as quickly as thought of. I hope, in urging me to push the enemy, the department remembers that General Sherman took with him the complete organization of the Military Division of the Mississippi, well equipped in every respect, as regards ammunition, supplies, and transportation, leaving me only two corps, partially stripped of their transportation to accommodate the force taken with him, to oppose the advance into Tennessee of that army which had resisted the advance of the army of the Military Division of the Mississippi on Atlanta, from the commencement of the campaign till its close, and which is now, in addition, aided by Forrest's cavalry. Although my progress may appear slow, I feel assured that Hood's army can be driven from Tennessee, and eventually driven to the wall by the force under my command. But too much must not be expected of troops which have to be reorganized, especially when they have the task of destroying a force, in a winter's campaign, which was able to make an obstinate resistance to twice its numbers in spring and summer. In conclusion, I can safely state that this army is willing to submit to any sacrifice to crush Hood's army, or to strike any other blow which may contribute to the destruction of the rebellion.

This changed the tone of despatches from Washington and City Point. Grant and Stanton sent congratulations, and Grant, in his official report, after setting forth his impatience and apprehensions that Hood would go north, said of Thomas: "But his final defeat of Hood was so complete, that it will be accepted as a vindication of that distinguished officer's judgment." H. V. Boynton.

NASHVILLE, CHATTANOOGA AND SAINT LOUIS RAILWAY, The. The first advocate of the building of the Nashville and Chattanooga Railroad, the first railroad completed in the State of Tennessee, was Dr. James Overton, a man of far-reaching sagacity, dauntless courage and great faith in his well-matured convictions. In 1843, he offered himself a candidate for the legislature, basing his canvass on the promise that he would do all in his power to secure the construction of a railroad from Nashville to Chattanooga, to connect with the proposed Western and Atlantic Railroad, chartered to be built from Atlanta to Chattanooga, thus creating a large link in a great trunk line to extend from the Atlantic Coast to the Mississippi River. At that period, Chattanooga, or Ross Landing as it was then called, was but a small trading point in a wild, mountainous region, lately vacated by the Indians. Dr. Overton, with a keen foresight, however, recognized that this was the focus to which the lines of traffic from the Southern States must converge, and he believed that if connections should be opened between that point and Nashville the latter place would be able to control the large cotton trade of Georgia and Alabama. These arguments made little impression on the minds of the people, however, and Dr. Overton was not only defeated but the title "Old Chattanooga" was applied to him by those who derided his scheme as the impracticable dream of a visionary. Two years after the defeat of Dr. Overton the necessity for other outlets from Nashville besides the Cumberland River brought the subject of railroads under agitation again, and, through the pressure of many influential citizens of the State, the legislature passed an act on 11 Dec. 1845 incorporating a railroad from Nashville to Chattanooga. In 1847 this act was amended to permit the town of Nashville to subscribe the sum of $500,000 for the benefit of the road, and "to raise money on loans by pledging the faith of the corporation; by pledging a portion of its taxes; by mortgage or otherwise to an amount not exceeding what might be demanded for the calls on the stock." The town of Murfreesboro, Tenn., also subscribed $30,000; the city of Charleston, S. C., $500,000; and the Georgia Railroad and Banking Company of Augusta, Ga., $250,000. The balance of an approximate capital stock of $2,000,000 was subscribed by individuals in Nashville and along the line of the proposed road. Shares of stock had then a par value of $25 each and in many instances the subscriber paid for his stock by actual work on the line or in materials furnished. The State also gave material assistance by lending its endorsement to the bonds of the company issued from time to time on completed miles of road.

The first general meeting of the stockholders was held in the City Hall at Nashville on 24 Jan. 1848. V. K. Stevenson, who had so earnestly labored in the interest of the road, was elected the first president. Other presidents of the road to date are as follows: Michael Burns, 17 Feb. 1864 to 15 Aug. 1868; E. W. Cole, 15 Aug. 1868 to 15 Sept. 1880; J. D. Porter from the latter date to 10 Sept. 1884; J. W. Thomas, Sr., from then to 12 Feb. 1906; J. W. Thomas, Jr., 28 Feb. 1906 to 17 Dec. 1913; Maj. E. C. Lewis, 19 Dec. 1913 to 1 April 1914; and John Howe Peyton from the latter date to the present time. The first contract for any of the actual construction was let in August 1848 for cutting the tunnel under the Cumberland Mountain. Construction on other parts of the line began the latter part of that year. The first train ran from Nashville to Antioch on 13 April 1851, and when, on 4 July of the same year, a train arrived at Murfreesboro the event was made the occasion of a great celebration, people from all the country round being on hand to greet this sign of progress. By April 1852 the road had reached Bridgeport, Ala., on the Tennessee River, from which communication was immediately established with Chattanooga with the aid of steamboats; but the entire line, 151 miles in length, was not completed until February 1854. At that time the equipment of the road consisted of 17 engines, bearing names instead of numbers, among which were the *Tennessee, Nashville, Chattanooga, Governor Sevier* and *Governor Blount;* 11 passenger cars and 164 freight cars. The iron rail used in track was purchased in England and delivered at Nashville for about $45 per ton. In November 1871 the company acquired by purchase from the State of Tennessee the railroad properties of the Nashville and Northwestern Railroad Company, a line extending from Nashville, Tenn., to Hickman, Ky. In 1873 the name of the corporation was changed from that granted in the original charter, «The Nashville and Chattanooga Railroad Company,» to «the Nashville, Chattanooga and Saint Louis Railway.» The Western and Atlantic Railroad, extending from Chattanooga, Tenn., to Atlanta, Ga., is leased for 29 years from 27 Dec. 1890. The Paducah and Memphis division, extending from Paducah, Ky., to Memphis, Tenn., with a branch from Lexington to Perryville, is leased from the Louisville and Nashville Railroad Company for 99 years from 14 Dec. 1895. The several branches of the present system were built under separate charters, some of them by independent corporations. The parent company, therefore, operates its present mileage under the charters granted originally to the various corporations which have been merged from time to time into its line.

The total number of miles of line operated at present are approximately: main track, 1,230.76; second track, 54.10; spur track and sidings, 482.53. Its main line extends from Hickman, Ky., through Nashville and Chattanooga, Tenn., to Atlanta, Ga., and from Memphis through Jackson, Tenn., to Paducah, Ky. At the latter point physical connection has been made with the great system of the Chicago, Burlington and Quincy Railroad by means of about 12 miles of line of the Paducah and Illinois Railroad Company and a double track bridge across the Ohio River opposite Metropolis, Ill. It also reaches the great cotton manufacturing city of Huntsville, Ala., while other ramifying branches extend to various mining centres, agricultural districts and timber regions. To-day the road has few superiors, whether we consider the excellence of its roadbed; its admirable equipment; the beauty and historical interest of its scenery, or the fertility of the country through which it passes, while its strategical position in relation to the commerce of the land is not surpassed by that of any other railroad system in the South. At many of the termini of its divisions it connects with a cluster of railroad systems that run to every point of the compass. It is also brought in closest touch with the great river trade of the Mississippi and its tributaries at several points, reaching the Mississippi River at Memphis and Hickman, Ky.; the Ohio River at Paducah, Ky., and the Tennessee River at Johnsonville, Tenn.; Bridgeport, Ala.; Hobbs Island, Ala.; Guntersville, Ala., and at Chattanooga, Tenn. It strikes the Cumberland River at Nashville and crosses the Chattahoochie River near Atlanta, Ga. The company in a recent statement reported its capital stock was $16,000,000; funded debt, $10,122,000; investment in road, equipment, etc., $37,707,297.02. The average yearly gross revenue is more than $12,000,000. Since beginning operations it has paid cash dividends of 185 per cent on its capital stock and in 1873 it gave the stockholders a stock dividend of 200 per cent. A majority of its capital stock has been held since about 1880 by the Louisville and Nashville Railroad Company, but its stockholders number above 600, located in 26 different States and three foreign countries. About 260 of its stockholders are women. According to the same statement its equipment consisted of 273 engines, 10,919 passenger, freight and work cars, two steamers and three transfer barges. Its roadbed for the main line is of full rock ballast and the weight of steel rails thereon is from 80 to 90 pounds to the yard.

During the Civil War the line of railroad was in charge of the Federal military authorities from 7 March 1862 to 15 Sept. 1865. Most of its equipment, however, was moved South at an early period in the war and operated on the rails of other lines in the interest of the Confederacy. Many important battles of the Civil War were fought along the line of its road and the territory contiguous thereto and its scenery is rich in historical interest. The corporation has maintained in an unusual degree the good will of the communities which it serves and is endeavoring to the utmost to advance the development of the country along its lines.

NASHVILLE, University of, in Nashville, Tenn., a coeducational institution founded in 1785 by the State of North Carolina as Davidson Academy. In 1806 after Tennessee had been founded, the name was changed to Cumberland College, and in 1826 to the University of Nashville. The school was closed during the Civil War. The trustees of the university and of the Peabody Education Fund united in 1875 in establishing a normal school for the training of teachers, which has since become, through co-operation of the university, a separate corporation — George Peabody College for Teachers (q.v.). Montgomery Bell Academy, the preparatory department, has six instructors and about 200 pupils. The other collegiate departments, both literary and medical, have been discontinued. The library contains over 2,000 volumes, and the grounds, buildings and furnishings are valued at $150,000; the productive fund is about $106,500; and the annual income about $10,000.

NASHVILLE CONVENTION, in American history, a convention of delegates from the Southern States held at Nashville, Tenn., 10 June 1850, called to consider the slavery question and the encroachments of Northern abolitionists. The Wilmot Proviso and the Missouri Compromise were disapproved, but resolutions of open resistance advanced by Texas, South Carolina and Mississippi were voted down. The convention, which was never generally popular, met again in November and again moderate resolutions were adopted. For text of the resolutions adopted at both meetings consult Harper's 'Encyclopedia of United States History' (Vol. VIII, New York 1915).

NASIK, nä'sĭk, or **NASSICK,** India: (1) the capital of a district of Bombay on the Godavari, 31 miles from its source, and 100 miles northeast of Bombay. It is the headquarters of Brahmanism in the Deccan and one of the most sacred of Hindu pilgrim resorts; the banks of the river here are crowded with temples and shrines. Nasik is the Nasica of Ptolemy and was anciently a Mahratta capital. It has noted manufactures of brass and copper work, paper and cotton. Interesting relics of the religion were found in the Lena caves excavated in the 2d or 3d century A.D. Pop. about 35,000. (2) The district has an area of 5,940 square miles; pop. about 825,000.

NASMYTH, nā-smĭth, **Alexander,** Scottish painter: b. Edinburgh, 9 Sept. 1758; d. there, 10 April 1840. He chose portrait painting as his specialty; became Allan Ramsay's pupil and subsequent assistant and accompanied that artist to London. He returned to Edinburgh (1779); and traveled in Italy (1782), where he devoted himself to landscape and historical painting. Among his works is the famous portrait of Burns in the London National Gallery; the large 'River Scene' owned by the Society of Arts; 'The Port of Leith' (1824); and 'The Lawn Market' (1824); in 1822 he published 16 scenes described by Sir Walter Scott. His landscapes are finely composed and very impressive, though he is inferior as a painter to his son Patrick (q.v.). His style is simple, rarely striving for grand effects. His scenes are naturally picturesque and well chosen. His coloring is somewhat weak and his execution of a neat and detailed rather than a vigorous character. The Nasmyths were an artistic race and between 1829 and 1866 no less than six woman painters of the family exhibited in London.

NASMYTH, James, Scottish engineer: b. Edinburgh, 19 Aug. 1808; d. South Kensington, 7 May 1890. He was the son of Alexander Nasmyth (q.v.). After study at Edinburgh University, he went to London in 1829, offered his services to Maudsley, founder of a well-known engineering firm, and was appointed assistant in his private workshop. There he remained till 1831, when he returned to Edinburgh and constructed a set of engineering tools with which he began business in 1834 at Manchester. Here he was so successful that he had soon to erect a large new workshop at Patricroft near Manchester, where he became famous as a machine constructor and inventor. Chief among his inventions was the steam-hammer, designed in 1839 and in 1842 patented in an improved form. The first hammer was constructed from a view of Nasmyth's sketches by Schneider at Creuzot, in France, about 1841; but the first British one was erected by Nasmyth at Patricroft in 1843. Among Nasmyth's further inventions are a nut-shaping machine, a hydraulic punching-machine and a flexible shaft for driving small drills. In 1856 he retired from the firm of Nasmyth, Gaskell and Company, which which he had founded, and devoted himself to the study of astronomy. He was the first to observe the mottled appearance of the sun's surface known as «willow-leaves» or «rice grains» (1860). He is author of 'Remarks on Tools and Machinery' in Baker's 'Elements of Mechanism' (1858); 'The Moon Considered as a Planet, a World and Sattellite' (1874), with James Carpenter, and an autobiography edited by Dr. S. Smiles (1883, latest ed. 1895).

NASMYTH, Patrick Milner, Scottish painter: b. Edinburgh, 7 Jan. 1787; d. Lambeth, London, 17 Aug. 1831. He studied under his father and developed a great talent for landscape, though he labored under the difficults of ill health and a crippled right hand which necessitated the use of the left in painting. He came to London in his 20th year and made his reputation by his first picture exhibited at the Royal Academy, 'A View of Loch Katrine' (1809). He invariably painted *en plein air,* and in his last sickness was raised on his bed that he might watch through the window the violent thunderstorm that was raging outside and in the progress of which he expired. His pictures are highly valued and his 'View in Surrey' sold in 1892 for $13,125.

NASO, nä'sō. See OVID.

NASR-ED-DEEN, näs'r-ĕd-dēn', Shah of Persia: b. 24 April 1831; d. 1 May 1896. He was not the eldest son but the ability and influence of his mother induced his father, Mohammed Mirza, to proclaim him his heir and he succeeded to the throne in 1848. His accession was disputed by the reformer, El Bab, but the new Shah crushed the opposition mercilessly and became the ablest ruler that Persia had had in many years. He studied European methods of warfare and proved himself a master of finance. He crushed the insurrections which broke out in various provinces and by his occupation of Herat in 1856 provoked a war with Great Britain which was concluded in 1857. In 1873–78 and in 1889 he visited western Europe and endeavored to establish more friendly relations with England, soon, however, returning to his friendship with Russia. He favored progress and Western civilization in so far as it did not conflict with his despotic rule and under his reign the telegraph through Persia connecting Europe and India was built. He was assassinated in 1896. Consult Morgan and Burger, 'Nasr-ed-Din, Schah und das moderne Persia' (Dresden 1889); Greenfield, J., 'Die Verfassung des persischen Staates' (Berlin 1904); Jackson, A. V. W., 'Persia Past and Present' (New York 1906).

NASSAU, näs'sow, **Joan Mauritz van,** COUNT OF NASSAU-SIEGEN, Dutch general and statesman: b. Delft, Holland, 17 June 1604; d. Cleves, Prussia, 20 Dec. 1679. He was governor-general of the Dutch possessions in Brazil in 1637–44 and had a brilliant and prosperous administration. He defeated the Spanish and Portuguese and upon his return to Holland was made lieutenant-general of cavalry; in 1647 he was governor of Cleves and in 1665 commanded the army of the Netherlands. In 1671 he was made field-marshal and led the forces against Louis XIV in the Spanish Netherlands. He became governor of Utrecht in 1674. Consult Driesen, ‹Leben des Fürsten J. Moritz von Nassau-Siegen› (Berlin 1849).

NASSAU, näs'â, the capital of the Bahama Islands (q.v.), situated on the north coast of New Providence, the largest island of the group. The town is built on a steep hill, is well laid out and has fine government and other public buildings and handsome residences. The climate is mild and healthful and Nassau is a popular winter health resort for Americans and West Indians. There is a good harbor and an active general trade is carried on. The United States is represented by a consular agent. It was founded by the English in the 17th century, destroyed by the French and Spaniards in 1703 and rebuilt in 1718. It was fortified 20 years later and opened to free trade. Pop. 10,000, chiefly colored.

NASSAU, Germany, a former independent duchy, now as Wiesbaden, forming a district of the Prussian province of Hesse-Nassau (q.v.). The chief town is Wiesbaden (q.v.). The family of Nassau, the elder branch of which reigned till 1866, dates from the 10th century. The younger branch inherited in 1544 the principality of Orange, and as the princes of Orange took an important place in European history. The reigning Duke of Nassau sided against Prussia in 1866 and his duchy was incorporated with Prussia. (See PRUSSIA; GERMANY). On the extinction of the male line of the Orange branch by the death of William III of Holland, in 1890, the Duke of Nassau became Grand-Duke of Luxemburg.

NASSE, näs'sĕ, **Erwin,** German political economist: b. Bonn, 2 Dec. 1829; d. there, 4 Jan. 1890. He was educated in Bonn and became prominent as an economist. In 1869–79 he served in the Prussian Lower House and in 1889 became a member of the House of Peers. He founded and was president of the Verein für Socialpolitik. He published ‹Über das preussische Steuersystem› (1861); ‹Über die mittelalterliche Feldgemeinschaft in England› (1869); ‹Agrarische Zustände in England› (1884).

NASSICK. See NASIK.

NAST, Thomas, American caricaturist: b. Landau, Bavaria, 27 Sept. 1840; d. Guayaquil, Ecuador, 7 Dec. 1902. His mother brought him to this country in 1846. He was employed as doorkeeper in Bryant's Art Gallery, Broadway and 13th street, New York, where he spent his spare time copying the paintings. For six months he studied in a drawing class, then became a draughtsman for *Frank Leslie's.* In 1860 he was sent to England to draw for the *Illustrated News* the Heenan-Sayers prize fight; in 1861 drew sketches of the Italian campaign; in 1862 joined the *Harper's Weekly* staff and by his clever cartoons soon became famous. But with his purely political and personal caricatures dating from 1871–73, when he attacked the Tweed Ring in New York City, drew the money-bag head of Tweed and the first Tammany tiger and largely contributed to the defeat of the Ring, he came to new fame and power. He bitterly opposed Greeley in 1872, Tilden in 1876 and Hancock in 1880, urging against each of these nominees his inevitable connection with Tammany Hall. In 1884 he attacked the Republican candidate for the only time, but with unusual bitterness. He left *Harper's Weekly* in 1887 and in 1894 became a member of the staff of the *Pall Mall Gazette.* In May 1902 he was appointed United States consul at Guayaquil, where he died of yellow fever. For several years he published ‹Nast's Almanac,› with his own illustrations to text by various authors and illustrated ‹Pickwick Papers› and ‹Pictures from Italy.› Nast did some oil-painting, especially of scenes in the Civil War. He was a great caricaturist, as realistic as the French masters in his groups and as dignified as Tenniel in his single figure cartoons. Consult Paine, A. B., ‹Thomas Nast: His Period and His Pictures› (New York 1904) and ‹Life and Letters of Thomas Nast› (ib. 1910).

NAST, William, American clergyman and editor: b. Stuttgart, Germany, 15 June 1807; d. Cincinnati, Ohio, 16 May 1899. He was educated at Blaubeuren and studied theology at the University of Tübingen, but became a rationalist and took up literary work till 1828. He then came to America and was tutor at Duncan's Island, Pa., becoming (1830) librarian and instructor of German at West Point Military Academy. Resigning (1832), he became instructor of German, Greek and Hebrew at Kenyon College, Gambier, Ohio. He next (1835) joined the Methodist Episcopal Church and was appointed missionary evangelist for Cincinnati. Continuous persecution made his labor hopeless during his travels in the State and he returned (1838) to Cincinnati and founded the first German Methodist society in the United States, thus becoming the originator of German Methodism which now is in every State and extends to Germany and Switzerland. In 1839 he founded *Der christliche Apologete* at Cincinnati, a German organ of the Methodist Episcopal Church, being its editor for 53 years. Many German publications of the Church were edited by him. He wrote ‹Wesley's Sermons,› ‹Das Christentum und seine gegensätze› (1883); ‹A Commentary on the New Testament — Matthew, Mark and Luke› (1864); ‹The Smaller and Larger Catechism› (1868).

NASTURTIUM, the Indian cress (*Tropæolum majus*), a climbing annual plant, native of South America, with pungent fruits and showy orange flowers; or *T. minus,* a smaller species. See TROPÆOLUM.

NASUA. See COATI.

NAT TURNER'S REBELLION, in American history, a term applied to a negro insurrection at Southampton, Va., in 1831. The rebellion was led by Nat Turner, a negro slave, who believed himself chosen by God to free the colored race. At an appointed time he set out with several hundred followers, going from house to house with the intention of killing all white persons. Before the authorities dispersed the rebels 55 persons were killed. The faithfulness of many of the slaves saved the lives of many whites. Many States enacted more stringent laws governing slaves, free negroes lost their privileges, suspects were killed or maltreated and the manumission movement received a staggering blow. See TURNER, NAT, and consult Drewry, W. S., 'The Southampton Insurrection' (Washington 1900), and Weeks, 'The Slave Insurrection in Virginia' (in *Magazine of American History* — New York, June 1891).

NATA, nä'tä, in Mexican mythology, the name of a former legendary prophet, who in the «Age of Water» (Atonatiuh) escaped with his wife, Nena or Xochiquetzal, from the general destruction of mankind by the deluge, in a boat made from the trunk of an ahuehuete, or Mexican cyprus tree, or according to another version, either in the hollow of the tree or on the trunk of the tree itself. The proper name of this legendary Nahuatl Noah is «Coxcox,» the term «Nata» being apparently corelative with «Tata,» the «old father,» or uncle or simply the «old one.» The legend of Coxcox was common not only to all the Nahuatl tribes, but it was recounted by the Zapotecas the Mixtecas and other cultured races of Mexico. According to this flood legend, Coxcox and his wife landed at Mount Colhuacan (Place of the Colhuas); and their children increased very rapidly; but they were all born dumb. Finally a dove took pity on them and gave them the power of speech. But they all spoke different languages. Of the descendants of Coxcox or Nata, 15 chiefs spoke the same tongue or nearly so; and from these were descended the different tribes of the Nahua race. According to a Michoacán version of the same myth, their deluge hero who was called Tezpi escaped in a large boat with his wife, his children and numerous animals and various kinds of grain for seed. According to still another version of this story, the people drowned in the deluge did not die but were turned into fishes; for the earth-ocean and the sky-ocean drew near to one another and they were overwhelmed in the down-pour of the sky-waters into the earth-waters, which swallowed up even the highest mountains for an Aztec century (52 years).

NATAL, na'täl, Africa, an original province of the Union of South Africa, formerly a separate colony on the southeast coast, bordering on the Indian Ocean and bounded by Portuguese East Africa, the Transvaal and Orange River colonies, Basutoland and Cape Colony. Including Zululand, annexed in 1897, it has an estimated area of 35,019 square miles. In January 1903 the former Transvaal districts of Vryheid, Utrecht and part of Wakkerstroom were transferred to Natal.

Topography.— The chief natural boundary on the land side is formed by the Drakensberg Mountains, separating it from the Orange River Colony and Basutoland. The Tugela River separates Natal proper from the Zulu country; on the southwest the Umzimkulu and Umtamvuma partly separate it from Cape Colony. The 400 miles of coast-line contains the mouths of numerous streams, but is destitute of creeks and bays, having only one sheltered anchorage at Port Natal (on which stands the seaport Durban), a fine circular bay completely landlocked, capacious enough to contain whole fleets and deep enough within to float the largest vessels. The surface is finely diversified, rising by successive terraces from the shore toward the lofty mountains on its western frontiers. The chief summits are Champagne Castle, 10,357 feet; Mont aux Sources, about 10,000 feet, and Giant's Castle, 9,657 feet. From the main chain numerous transverse branches proceed nearly at right angles and form a series of minor watersheds, separating the different streams. The mountains descend very gradually on the west and may be regarded as the abutments of a very elevated table-land, but they present precipitous fronts to the east and are so broken by chasms and ravines that they were at one time regarded as impassable.

Hydrography.— Natal has a great advantage over most of the districts of South Africa in its abundance of perennial streams, though these are all too shallow to be navigable, while many flow through precipitous ravines and rocky gorges. The most important rivers are the Tugela, which has a course of about 150 miles, its tributary, the Buffalo or Umzinyati, being also a considerable stream; the Umvoti, Umgeni and Umkomanzi, farther to the south and the Umzimkulu, which partly separates Natal from Cape Colony.

Geology and Mineral Resources.— The prevailing stratified rocks are sandstone and slate, often thrown into confusion and pierced by igneous rocks, particularly basalt, greenstone and porphyry, which assume the form both of continuous ridges and isolated hills and often cover extensive areas. The mineral productions are principally coal, iron-stone, limestone and marble. Coal is worked and is used on the railways and the iron-stone is also being utilized. About 3,000,000 tons is the normal annual output of coal and of gold about 2,000 ounces. There are rich gold-fields in Zululand.

Climate.— The climate on the whole is extremely salubrious. On the coast the range of temperature is from 47° to 88°, giving an average in summer of 76° and in winter of about 55°; in the interior, at the town of Pietermaritzburg, the mean temperature of July, the coldest month, is 55°; of February, the hottest, 80½°; and of the whole year, 67°. During the rainy season (October to March) thunder showers are of almost daily occurrence. Long droughts are almost unknown.

Vegetation.— Under such a climate, and with a soil of considerable fertility, vegetation is obviously vigorous. Timber-trees everywhere exist in sufficient numbers for the wants of the colony and on the western frontiers as well as elsewhere form considerable forests, for the most part unencumbered by the underwood which prevails in Cape Colony.

Fauna.— The wild animals include the leopard, hyena, tiger-cat, antelopes, jackal, antbear and porcupine. The hippopotamus has still his haunts in several of the rivers and there are numbers of small crocodiles; while snakes, some of them venomous, are also plentiful. The birds comprise the vulture, several varieties of eagle and the secretary-bird, etc.

Agriculture.— In the level districts of the interior, wheat, barley, oats, beans and vegetables of almost every description have been largely and successfully grown; but the chief crop everywhere is maize, of which even two good crops can be raised in the year. About 2,000,000 muids (200 lbs.) is the average annual output. In many parts the vine thrives well, various fruits are cultivated and could be produced in unlimited quantities. In the coast districts, where the climate is tropical, the sugar-cane is cultivated with success. In similar localities tobacco, arrowroot, ginger, bananas, pine-apples, etc., also grow well. Tea has begun to be cultivated with good prospects and coffee is also grown to a small extent.

Commerce, etc.— The total value of exports amount to about $25,000,000, wool being by far the largest, others being gold, sugar, coal; the imports are valued at about $60,000,000, mostly manufactured goods. The railways, which belong to the government, have a length of 1,053 miles and extend into the Orange River Colony and Transvaal. Separate trade returns are not available since the establishment of the Union.

Constitution and Government.— Natal, which had been annexed to Cape Colony in 1844, was placed under separate government in 1845 and under charter of 15 July 1856 was erected into a separate colony. By this charter partially representative institutions were established and, under a Natal Act of 1893, the colony obtained responsible government. The province of Zululand was annexed to Natal in 1897. The districts of Vryheid, Utrecht and part of Wakkerstroom, formerly belonging to the Transvaal, were annexed to Natal in 1903. In 1910 the colony was merged in the Union of South Africa. The seat of the provincial government is Pietermaritzburg. There are an administrator appointed by the governor-general for five years and a provincial council of 25 members elected for three years, each council having an executive committee of four, the administrator presiding at its meetings. In the Union Assembly at Cape Town Natal has 17 members.

Education.— With the exception of higher education, which is under the control of the Union, education comes under the provincial administration. There are three government high schools, two preparatory schools, 73 government primary schools, two government art schools, one agricultural and trades school, five government Indian schools, two government schools for colored children, besides 107 government-aided schools and 163 government-aided farmhouse schools for European children. Also there are two technical institutes, 34 Indian schools, 302 native schools and 17 colored schools, all of which receive government aid, and a considerable number of private schools in the province. Three of the aided schools are secondary schools for girls. The aggregate number of European pupils in regular attendance at the government and inspected schools was 19,892 in 1916; the average daily attendance 86 per cent of the number on the registers. At the government high and preparatory schools there is an average daily attendance of 1,274 pupils. About 1,500 children attend private unaided schools and it is estimated that only a very small percentage of white children are receiving no education. The direct government expenditure on schools for 1916 was $628,300 (excluding expenditures for furniture, buildings, but including maintenance). Fees paid by pupils in government schools in the same year amounted to $114,445. The number of European children receiving gratuitous education was 3,695. The 302 schools for natives had a total enrolment of 21,700 and received in 1916 grants in aid aggregating $107,935 and the 34 Indian schools had a total enrolment of 4,438, for which a grant of $28,295 was expended.

History.— Natal owes its name to having been discovered on Christmas Day, 1497, by Vasco da Gama. In 1823 a small English settlement was formed on Port Natal. Subsequently large numbers of discontented Boers from the Cape Colony entered the country as settlers. A treacherous massacre of part of the Boers by Dingaan, chief of the Zulus, in 1838, led to hostilities, in which Dingaan was ultimately driven beyond the frontiers. In 1839 the Boers proclaimed themselves an independent republic, also declaring their determination to establish diplomatic relations with European powers. The establishment of a hostile settlement at the only port between Algoa and Delagoa bays, and at a valuable entrance from the coast to the interior of South Africa, was so obviously incompatible with British interests that a force was dispatched from the Cape and after some fighting the Boers submitted, except a discontented section, who retired beyond the Drakensberg range. The territory was proclaimed British in 1843. It formed an integral part of the Cape Colony until 1856, when it was erected into a separate colony. Its prosperity has been affected by the Kaffir troubles, as well as by the British complications with the Transvaal Boers; and in 1899–1900 it suffered severely in the South African War (q.v.). There was a Zulu insurrection in the Tugela region in 1906, thousands of the natives losing their lives in the subsequent fighting. By referendum in 1908 Natal determined to join the Transvaal, but in the following year was admitted as an original province of the Union of South Africa. Pop. 1,108,754, including 1,011,645 native or colored and 97,109 Europeans.

Bibliography.— Barnett and Sweeney, 'Natal: The State and the Citizen' (New York 1904); Doyle, A. C., 'The Great Boer War' (London 1900); Holden, W. C., 'History of the Colony of Natal, South Africa' (London 1855); Brooks, H., 'Natal' (London 1887); Ingram, J. F., 'History of Natal and Zululand' (ib. 1897); Kermode, W., 'Natal' (ib. 1882); Holt, H. P., 'Mounted Police of Natal' (London 1913); Bosman, W., 'The Natal Rebellion of 1906' (ib. 1907); Robinson, 'A Lifetime in South Africa' (ib. 900); Russell, 'Natal' (ib. 1900).

J. B. McDonnell.

NATAL, Brazil, the principal seaport and capital of the state of Rio Grande do Norte, on the right shore of the Potengy River near the Atlantic, 150 miles north of Pernambuco. Notwithstanding the sand-bars at the entrance to the harbor, considerable export trade is carried on chiefly of cotton, sugar, rubber, hides, lumber, etc., about $1,000,000 annually. The United States is represented by a consular agent. Natal was originally called Cidade dos Reis. Pop. 15,000.

NATALIE, năt'a̤-lē, a queen of Serbia: b. 14 May 1859. She is a daughter of Pierre Ivanovitch Keschko, a Russian officer, and married Prince Milan, afterward king of Serbia, in 1875. The marriage turned out unhappily and the union was broken in 1888, when Milan obtained a divorce. The king abdicated in the following year, and Natalie, returning to Belgrade, the Serbian capital, resided there for a time with her son, King Alexander, enjoying the favor of the people; but in 1891, at the request of the National Assembly, left the country on account of political interests. Becoming reconciled to Milan in 1893, she resumed her former relations with the royal family; and returning to Belgrade in 1895 she was greeted by the people with every token of popularity. Her residence has since been chiefly in Biarritz, France; and after the assassination of King Alexander (1903) the political authorities at Belgrade decreed that she should not again enter the Serbian kingdom. She became a Roman Catholic in 1902.

NATATORES, an obsolete group of birds, the swimmers, artificially allied by Illiger on their likeness in pursuing an aquatic life, but structurally having relationships with several natural orders. Similar illogical groupings in the same by-gone but once popular classification were *Clamatores,* the screamers; *Scansores,* the climbers; *Cursores,* the runners, etc.

NATCHEZ, năch'ĕz, Miss., city, county-seat of Adams County, on the Mississippi River, and on the Yazoo and Mississippi Valley, the Mississippi Central, the Natchez and Southern and the Saint Louis, Iron Mountain and Southern and Louisiana and Arkansas railroads, 297 miles by rail and 470 miles by river from Memphis, and 214 miles by rail and 265 miles by river from New Orleans. It has steamer connection with all the Mississippi River ports. The country surrounding Natchez is chiefly devoted to livestock and agriculture; cotton is the principal product. The principal industries of the city are packing plants, box factory, cotton mills, broom factories, oil mills and candy factories. It has ice factories, planing mills, foundries, machine shops and furniture factories. Natchez has a large trade in cotton, shipping each year thousands of bales. Considerable rice and sugar-cane are shipped from this port. The city has a Confederate Memorial Park, Baker Grand Theatre, Duncan Memorial Park and public buildings, Institute Hall, several excellent hotels and a large number of handsome residences. It is the seat of Jefferson Military College; Natchez Institute; and Natchez College (colored); has good public and parish schools, the Fisk library and the Carpenter Public Library. Natchez has one Associated Press paper. There are four orphanages, a charitable hospital, three sanatariums and a number of private schools. The government, in accordance with the charter of 1877, is vested in a mayor, who holds office two years, and a council. The school board are elected by the council. The waterworks are municipal property. The city is built on a bluff about 200 feet above the river. On this bluff was located the first settlement, by Bienville, who built here Fort Rosalie in 1716. The place was destroyed and many of the inhabitants murdered, in 1729, by the Natchez Indians. The fort came into possession of the English in 1763, when the name was changed to Fort Panmure. In 1779 the Spaniards took possession, and in 1793 the United States became undisputed owner of lands east of the Mississippi, which included Natchez and much of the adjacent territory. From 1798 to 1820 Natchez was the capital of Mississippi; in 1803 it was incorporated as a city. During the Civil War the city suffered considerable loss of property and damage. In 1862 Commodore Porter shelled the city, and in 1863 Federal troops took possession and retained control until peace was declared. On a bluff just outside the city limits is a national cemetery and an observatory affording extensive views. Pop. 15,000.

NATCHEZ, nä-chāz, **Les,** a romance by Chateaubriand, published in 1825–26, many years after the author first planned it. The work was written during his exile in England, long after his journeyings in America, of which country it contains his views as well as setting forth his psychological speculations and philosophy of life.

NATCHEZ INDIANS. See CREEKS.

NATCHITOCHES, năch-ĭ-tŏch'ĕz, an American Indian tribe formerly living along the banks of the Red River, in Louisiana. They were driven from their homes by the Natchez and united with the Caddoes in 1731. They made homes in rough dwellings covered with sod. Certain phases of their religious practices demanded human sacrifice.

NATCHITOCHES, năk-ĭ-tŏsh', La., town, parish-seat of Natchitoches Parish, on a short stream which flows into the Red River, and on the Texas and Pacific Railroad, about 150 miles in direct line northwest of Baton Rouge. The town is on the site of what was once a French trading post established in 1714. It is situated in an agricultural region in which the chief products are sugar-cane and cotton. Considerable attention is given to stock-raising. The principal industries of the town are connected with the shipment of the agricultural products and livestock. It is the see of a Roman Catholic bishop, and there is a State Normal School and Saint Mary's Academy (R. C.); it has a high school, public and parish elementary schools. Pop. 2,600.

NATHAN, Hebrew prophet in the time of David and Solomon. He was in his day the latest direct descendant and representative of the school of the prophets under Samuel. Saint Jerome mentions a Jewish tradition which identifies him with the eighth son of Jesse, but there is no ground for this supposition. His earliest appearance in the history of David is as the king's counsellor, first advising the building of the temple and then after a vision announcing that the time had not yet come (about 1010 B.C.). His power, eloquence and tact as a prophet are shown by his exquisite apologue of the ewe lamb which brought David to a sense of his guilt in the case of Bathsheba (1000 B.C.). On the birth of Solomon the prophet named the child Jedidiah, «friend of the Lord,» and was entrusted with his education. When the end of David's reign approached Nathan advocated the succession to Solomon, counseled Bathsheba to secure it, and rebuking the indifference of the king obtained his presence and assistance at the inauguration of his successor (977 B.C.). Nathan's sons occupied high posts in the new court, Nabud being «the king's friend» and principal officer or chamberlain, while Azariah was over the «twelve officers which provided victuals for the king and his household.» It was in accordance with the counsels and suggestions of this prophet that David, the year after his son's accession, crowned the work of his life, as poet, musician and promoter of a rich temple ritual, by introducing into public worship an orchestra of Levites. Eccles. ix, 14–16, a passage attributed to Solomon, is evidently an imitation of 2 Sam. xii, 1–4, which shows how the influence of Nathan was perpetuated in the literature of succeeding ages. In I Chron. xxix, 29, and II Chron. ix, 29, he is mentioned as historian of the reigns of David and Jonathan He died about 935 B.C., and his grave is still pointed out at Halhul, five miles north of the ancient Hebron. An echo of his parable of the rich man with many flocks is found in the Koran Sura xxxviii, 20–25.

NATHAN, George Jean, American dramatic critic and magazine editor: b. Fort Wayne, Ind., 15 Feb. 1882. He was educated at Cornell University and entered journalism in 1904. In 1906 he became dramatic critic to the *Bohemian Magazine,* in 1908 to *Harper's Weekly,* and in the same year to *The Smart Set.* Since 1906 he has contributed articles on the current drama to many other magazines, and has also written for a newspaper syndicate. In 1914 he became part owner of *The Smart Set* and joint editor with H. L. Mencken (q.v.). His publications include 'Europe After 8.15,' with H. L. Mencken and W. H. Wright (1914); 'Another Book on the Theatre' (1916); 'Bottoms Up' (1917); 'Mr. George Jean Nathan Presents' (1917); 'A Book Without a Title' (1918); 'The Popular Theatre' (1918); 'Comedians All' (1919); 'The American Credo,' with H. L. Mencken (1920); 'Heliogabalus,' a play, with H L. Mencken (1920). Another play 'The Eternal Mystery,' was produced in 1913. Nathan's criticism is marked by a pungent and original style, an independence of all academic standards, and an extensive knowledge of dramatic literature, particularly the foreign. His reviews are frequently republished in France, and he has been praised by Gordon Craig as the ablest of American dramatic critics.

NATHAN, Maud, American reformer: b. New York, 1862. She was educated at private school and Green Bay, Wis., High School. In 1880 she married Frederick Nathan; was speaker before the International Congress of Women, in London (1899), at Berlin (1904) and International Peace Congress, New York (1907), and International Conference of Consumers' Leagues, Geneva (1908). In 1908 she was also a delegate at the International Congress for Labor Legislation, Lucerne (1908), since which she has preached and lectured in the principal cities of the country. She was a delegate to the International Woman Suffrage Convention at Stockholm (1911) and at Budapest (1913) and numerous other conferences abroad. She has been president of the Consumers' League of New York (1897–1917) and vice-president of the National Consumers' League.

NATHAN THE WISE. Lessing's immediate occasion for writing 'Nathan der Weise' («Nathan the Wise,» 1799) was the necessity of finding a form, to which the censor could take no exception, for final utterance of some sentiments on the subject of personal religion which he had very much at heart. During a controversy with the Pastor Goeze in Hamburg he had had abundant experience of the pharisaical intolerance of the Lutheran orthodoxy of his day; and, on the other hand, his dear friend Moses Mendelssohn gave him an example of one of the gentlest, most enlightened of spirits in a member of a despised and persecuted sect. The idea of a dramatic poem on the subject of 'Nathan' goes back, however, some 25 years before this time.

The central *motif* Lessing adapted to his purposes from one of the stories of Boccaccio ('Decameron,' first day, third novel): Saladin, desiring to extort money from the Jew Melchizedek, invites him to declare which is the true religion. The Jew begs leave to tell a story: a father, possessed of a precious ring and having three sons equally dear to him, causes two rings to be made so nearly like the true one that he himself can hardly tell which is which, gives each son one ring, and nobody can decide who is heir of the original. So it is with the three principal religious faiths. Lessing's version attributes to the true ring the special virtue of making its wearer acceptable in the sight of God and man, provided he wears is confident of that effect. Proof, then, for each son that his ring is genuine will appear in the use that he makes of it. The moral is obvious: faith is the working out of salvation, not the possession of the truth. And from this follows a sufficient principle of conduct: act so as to deserve, and the right that you earn is right indeed, so far at least as any human being can judge. Translated by Ellen Frothingham (New York 1892), and by E. K. Corbett (London 1883). Edited by G. O. Curme (New York 1898) and by J. C. Robertson (Cambridge, England 1912).

William G. Howard.

NATHANAEL, one of the earliest believers in and follower of Christ. He was a native of Cana in Galilee and attached himself to Jesus on becoming convinced of the Messiahship of the son of Mary by his miraculous insight and power of reading the heart (John i, 46–49). On the hypothesis that he was one of the 12 he has been identified with Bartholomew, but on insufficient grounds. There is a tradition that Nathanael was the bridegroom at the marriage at Cana, and Epiphanius implies that he was one of the two disciples whom Jesus overtook on the way to Emmaus.

NATHORST, nät'hôrst, **Alfred Gabriel,** Swedish scientist: b. Wäderbrunn, near Nyköping, 7 Nov. 1850. He studied at Lund and Upsala, served (1874) as privat docent in geology at Lund and (1873–84) as geologist on the royal Swedish geological research, becoming (1885) intendant of the palæontological plant collection of the Stockholm Riks Museum. In 1870 and 1882 he was exploring in Spitzenbergen and (1873–84), in south and central Sweden. In 1883 he accompanied the Nordenskiöld expedition to Greenland and (1898) led an Antarctic expedition. His researches in the field of glacial flora fossils were very fruitful. He wrote 'Jordens historia' (Stockholm 1888–94); 'Sveriges Geologi' (ib. 1892–94); 'Zur fossilen Flora der Polarländer' (ib. 1894—); 'Två somrar, i Norra Ishafvet' (ib. 1901); 'Polarforskingen' (ib. 1902). He also edited (1895–98) the periodical *Ymer.*

NATICA, a genus of sea-snails, forming the type of the family *Naticidæ.* The shell is globose in form, the spiral portion being minute and indistinctly marked, smooth and porcelain-like and its aperture of large size and semicircular form. The animal appears large in proportion to the shell, the foot especially being extensive. The mantle-lobes partly conceal the shell, and an operculum is always present. Most of the genera of this family are marine, and the white, chalky *N. heros* is a familiar species all along the eastern coast of the United States, and lays its eggs in a collar-shaped mass of glutinous material mixed with sand which often excites the curiosity of the stroller by the seaside. This shell is the one most frequently chosen by our hermit-crabs. It may attain a diameter of three and a half inches and a length of five inches. South of Cape Cod *noticon duplicata* is common. Consult Arnold, 'The Sea-Beach at Ebb Tide' (1901).

NATICK, nā'tĭk, Mass., town in Middlesex County, on the Charles River and on the Boston and Albany Railroad. The head of Cochituate Lake, one of the sources of the water supply of Boston, is in the northwest part of the town. The place was founded by John Eliot (q.v.), and from 1651 to the time of the founder's death it was used chiefly as a home for converted Indians. In 1781 it was incorporated as a town. The chief manufactures are shirts, men's clothing, boots, shoes edge tools, boxes, baseballs and supplies for athletic games. A monument in honor of John Eliot is in one of the public parks and a soldiers' monument in another park. Some of the educational institutions are the Morse Institute, the Walnut High School for young women and the Bacon Public Library. Pop. 10,907. Consult Hurd, 'History of Middlesex County, Mass.'; Bacon, 'History of Natick.'

NATION. See NATIONALITY; NATIONALISM.

NATIONAL ACADEMY OF DESIGN. An American association devoted to the fine arts, membership in which is limited to 125 painters, 25 sculptors and 25 architects and engravers. In 1906, joined by the Society of American Artists (q.v.), the National Academy became affiliated with Columbia University and the Metropolitan Museum of Art. The school of design conducted since 1825 in connection with the academy, in recent years is located at Amsterdam avenue and 109th street and is open for instruction from October to May; the home and exhibition building of the society is at 215 West 57th street. The instructors in the school are selected from the governing council of the academy, which consists of its officers and six members. The average annual attendance of students is between 200 and 300. The annual exhibitions of the National Academy are features of the art life of the metropolis, interest being focussed on the awards of the Inness gold medal for the best landscape, the Hallgarten prizes respectively of $300, $200 and $100, and the Clarke prize of $300. First known as The New York Drawing Association, a secession in 1825 of young artists from the first academy of arts in New York founded in 1802, the present name was adopted in 1828 when the society composed of 30 members with Prof. S. R. Morse (q.v.) as president, was incorporated. Consult Cummings, T. S., 'Historic Annals of the National Academy of Design' (Philadelphia 1865); Catalogues of the Annual Exhibtions (New York 1826, to date).

NATIONAL ACADEMY OF SCIENCES, The, an American institution, founded in 1863 and consisting of members elected from among the most distinguished scientific men of the United States; analogous to the Royal Society of London.

NATIONAL APPROPRIATIONS. See APPROPRIATIONS, AMERICAN SYSTEM OF; BUDGETS, AMERICAN.

NATIONAL ASSOCIATION OF CORPORATION SCHOOLS, The. In 1911 The New York Edison Company established a commercial school to correct faulty fundamentals of employees of that company; to train employees in the duties they were then performing, and for more advanced work. As the movement progressed there was publicity in the New York press which resulted in a large number of inquiries from members of industrial institutions throughout the United States as to: (1) Why the school was established. (2) What was taught in the school. (3) What results had been attained.

The volume of such requests led to the conclusion that there was need for a clearing-house to which those interested might contribute and from which they might secure information. This plan was discussed by the organizer and a few acquaintances who were interested in the subject of better education and better training for the workers of the United States.

After several months of preliminary effort an organizing convention was held at New York University on 24 Jan. 1913; 35 industrial institutions sent delegates. A provisional organization was perfected and officers chosen.

On 4 April following the executive committee met, declared the charter closed and The National Association of Corporation Schools was a reality. In the fall of 1913 the first annual convention was held in the Hall of Education of the National Cash Register Company at Dayton, Ohio, and in 1914 the annual convention was held in the auditorium of the Curtis Publishing Company in Philadelphia. The 1915 meeting was held at the Hotel Bancroft in Worcester and in 1916 convention at the Carnegie Institute of Technology in Pittsburgh. In 1917 the association met as the guests of the Larkin Company at Buffalo. The 1918 convention was scheduled to be held in Chicago, but upon the entranee of the United States into the World War the association pledged its members and its resources to the government. Because of the peculiar fitness of membership nearly all of the active workers were taken into government service in some capacity, which prevented the meeting at Chicago.

The commercial school established by The New York Edison Company was not the first corporation school in the United States. There are different claims as to where the first school of this character was held. The Pennsylvania Railroad Company, prior to the Civil War, held conferences at its Altoona shops, and the Werner Book Publishing Company of Akron, Ohio, held conferences of its salesmen. Other industrial institutions have come forward with claims of having established schools, but the most authentic information regarding educational activities on behalf of employees of an industrial institution indicates that the first school to be called a *school,* inaugurated by an industrial institution was held by the National Cash Register Company in April 1896. This school has been convened more or less consecutively from that time on down to the present date.

The growth of the Association has been steady, and now embraces in membership a total of 117 industrial institutions, including over 70 different branches of the industries of the United States.

NATIONAL ASSOCIATION OF MANUFACTURERS, The. A convention, consisting of several hundred representative American manufacturers, met in Cincinnati, Ohio, 22 Jan. 1895, and provided for the organization of a national association of manufacturers. At the first annual convention of the Association held in Chicago 21 Jan. 1896, the name «The National Association of Manufacturers of the United States of America» was adopted, a preamble setting forth the objects of the Association was published, and a constitution was adopted. The constitution has been revised, elaborated and amended several times to cover the constantly expanding activities of the Association, and in 1908 a new constitution was adopted.

The general objects for which the Association works are: (1) the promotion of the industrial interests of the United States; (2) the fostering of domestic and foreign commerce; (3) the betterment of the relations between employers and their employees; (4) the education of the public in the principles of individual liberty and the ownership of property; and (5) the support of legislation advancing development along the lines above defined, and opposition to legislation retarding it.

To the individual manufacturer the Association offers its trained and practical assistance in supplying accurate and reliable information on pertinent subjects, and organized protection against abuses and unlawful and unjust exactions, unbiased mediation in cases of dispute, and the furtherance of cordial relations between the several members.

The foreign trade department has been highly organized in three divisions devoted to (1) Latin-American trade; (2) Russian trade and (3) Far-Eastern trade; and in six bureaus devoted to general information; foreign buyers; credits; translations; trademarks and publicity. These are in charge of a staff of experts in the several lines, and are in constant communication with a corps of over 2,000 correspondents located in every city and town of commercial importance in all foreign lands. To the individual member of the Association the foreign trade department offers quotations and suggestions from foreign markets; confidential reports on foreign trade opportunities; advice as to advertising, financing foreign accounts, foreign collections, etc.; reports on the financial standing of foreign firms; translations of foreign letters; information as to the customs duties of all countries and shipment thereto; registration of trademarks, etc.

The law department is devoted strictly to matters which pertain to the pursuits of the Association, and aims to keep its members fully abreast of all decisions and interpretations of the law which can in any way affect their business interests.

In the home department the Association has a number of committees specializing on health and safety; industrial betterment; industrial publicity; industrial education; immigration; banking and currency; trade acceptances; uniform State laws and foreign trade.

Through its business corporation, «The National Manufacturers' Company,» the Association publishes a monthly magazine under the title *American Industries,* and issues periodically *The American Trade Index* containing alphabetically paragraphs concerning the business and products of its several members. These are indexed in several foreign languages and are sent to prominent merchants and buyers in foreign countries. Nearly 44,000 copies of this index have been thus distributed.

The membership consists of individuals, firms and corporations actually engaged in manufacturing. The executive officers, the president and the treasurer are elected annually by ballot and the secretary is appointed annually by the executive committee. The executive committee consists of the president, the treasurer, secretary, a vice-president from each of the 12 States having the largest recorded membership in the Association upon election day of its annual convention, and six members at large elected by the executive committee as thus constituted. The members paying the same annual dues, $50, are exactly similar in voting power in the annual conventions, and the democracy of management is still further secured by the choice of vice-presidents by the different State delegations attending the annual convention. The entire income of the Association is expended in the interest of its members; the president, vice-presidents and the directors serve without compensation. The Association maintains an extensive reference library at its general offices in New York City.

NATIONAL ASSOCIATION FOR THE STUDY AND PREVENTION OF TUBERCULOSIS, The, an organization composed of prominent American physicians who are especially interested in preventing the further spread of consumption. The headquarters are at 105 East 22d street, New York.

NATIONAL BANKING ACT. See BANKS AND BANKING.

NATIONAL BANKING SYSTEM. See BANKS AND BANKING — NATIONAL BANKING SYSTEM.

NATIONAL BANKS. See BANKS AND BANKING — NATIONAL BANKING SYSTEM (Article 9) and Bank Organization and Management.

NATIONAL BOARD OF HEALTH, The, a Federal body, instituted by Act of Congress, 3 March 1879, to consist of 11 members — one army surgeon, one navy surgeon, one medical officer of the marine hospital service, one officer of the Department of Justice and seven physicians from civil life appointed by the President. Industrial development had rendered all sections of the country interdependent in matters of health, and isolation was no longer possible. At the period of the passage of the Act of Congress there were only State and local systems of quarantine in existence in the United States, and Congress did not regard them as adequate to meet all the emergencies that had arisen or that might arise in the prevention of the introduction of contagious and infectious diseases from foreign countries. The Act was designed to establish a complete and effective system of quarantine to the United States. National authority was required to secure : (1) International sanitary co-operation; (2) the collection and distribution of sanitary information; (3) the preparation of maritime sanitary regulations; (4) the enforcement of maritime sanitary inspections in foreign ports; (5) the erection and maintenance of refuge stations; (6) the aid of State authorities; (7) the organization of quarantine where none exists; (8) the power to add necessary rules to any deficient quarantine. A further act (2 June 1879) defined the powers and duties of the Board and transferred to it the quarantine work formerly conducted by the Marine Hospital Service. This Act limited the duration of the Board to four years so that it expired by limitation 2 June 1883. Its work was carried on during 1884 and 1885, when, the appropriation being exhausted, its activities ceased.

The work is now performed by the Bureau of the Public Health Service under the direction of the surgeon-general, and as a part of the Treasury Department. Consult Allen, 'Rise of the National Board of Health' (1899).

NATIONAL BOUNDARIES. See Boundaries of the United States.

NATIONAL BOUNDARY CHANGES. For the decisions and awards of the Peace Conference relating to the various nations, see War, European.

NATIONAL BUDGETS. See Budgets, American; Appropriations, American System of.

NATIONAL CEMETERIES are burial grounds, instituted by Act of Congress, for the interment of United States soldiers and sailors who have fallen in battle or all men and women who have died in the regular or volunteer military or naval service of the United States after having been mustered out or honorably discharged. The presentation of the commission warrant, letter of appointment, certificate of discharge or pension certificate, provided there be no dishonorable charges connected therewith, are sufficient evidence for interment. Wives of officers and enlisted men may be interred in national cemeteries, according to certain regulations. National cemeteries are under the charge of the quartermaster-general, who is represented by the officer of the corps nearest to the cemetery. There are 84 cemeteries, all of which are within the continental limits of the United States, except one in Mexico. The following is a list of national cemeteries:

Alexandria, La.
Alexandria, Va.
Andersonville, Ga.
Andrew Johnson, Greenville, Tenn.
Annapolis, Md.
Antietam, Sharpsburg, Md.
Arlington, Va.
Balls Bluff, Leesburg, Va.
Barrancas, Fla.
Baton Rouge, La.
Battleground, Washington, D. C.
Beaufort, S. C.
Beverly, N. J.
Brownsville, Tex.
Camp Butler, Ill.
Camp Nelson, Ky.
Cave Hill, Louisville, Ky.
Chalmette, La.
Chattanooga, Tenn.
City Point, Va.
Cold Harbor, Va.
Corinth, Miss.
Crown Hill, Indianapolis, Ind.
Culpeper, Va.
Custer Battlefield, Crow Agency, Mont.
Cypress Hills, Brooklyn, N. Y.
Danville, Ky.
Danville, Va.
Fayetville, Ark.
Finns Point, Salem, N. J.
Florence, S. C.
Fort Donelson, Dover, Tenn.
Fort Gibson, Okla.
Fort Harrison (Varina Grove, Va.).
Fort Leavenworth, Kan.
Fort McPherson, Maxwell, Nebr.
Fort Scott, Kan.
Fort Smith, Ark.
Fredericksburg, Va.
Gettysburg, Pa.
Glendale, Va.
Grafton, W. Va.
Hampton, Va.
Jefferson Barracks, Mo.
Jefferson City, Mo.
Keokuk, Iowa.
Knoxville, Tenn.
Lebanon, Ky.
Lexington, Ky.
Little Rock, Ark.
Loudon Park, Baltimore, Md.
Marietta, Ga.
Memphis, Tenn.
Mexico City, Mexico.
Mill Springs, Nancy, Ky.
Mobile, Ala.
Mound City, Ill.
Nashville, Tenn.
Natchez, Miss.
New Albany, Ind.
Newbern, N. C.
Philadelphia, Pa.
Poplar Grove, Petersburg, Va.
Port Hudson, La.
Quincy, Ill.
Raleigh, N. C.
Richmond, Va.
Rock Island, Ill.
Salisbury, N. C.
San Antonio, Tex.
San Francisco, Cal.
Santa Fe, N. Mex.
Seven Pines, Va.
Shiloh, Pittsburg Landing, Tenn.
Soldiers' Home, Washington, D. C.
Springfield, Mo.
Saint Augustine, Fla.
Staunton, Va.
Stone River, Murfreesboro, Tenn.
Vicksburg, Miss.
Wilmington, N. C.
Winchester, Va.
Woodlawn, Elmira, N. Y.
Yorktown, Va.

NATIONAL CITY BANK OF NEW YORK, The, chartered 16 June 1812, under "An Act to incorporate the stockholders of the City Bank of New York," was directly related to the dissolution of the first Bank of the United States, the charter of which, dated 1791, had expired in 1811, and was not extended, owing to political opposition to the Bank of the United States. The closing of the bank creating a need for a new strong banking institution in the metropolis, the directors of the City Bank of New York arranged that the holders of stock in the Bank of the United States might exchange that stock, upon equitable terms, for stock in the City Bank, and this offer was availed of to the extent of 10,000 shares, or $500,000 par value, of City Bank stock. As this comprised more than a majority of the original capital, the City Bank may be fairly said to have been a direct offspring of Alexander Hamilton's Bank of the United States. It opened for business in the banking-room that had been occupied by the New York branch of the Bank of the United States, at 52 Wall street, and remained in that location until it moved in 1908 into its present home, a handsome modern structure with a perfect equipment at 55 Wall street. The authorized capital of the bank was $2,000,000 in shares of $50 each, but it commenced business with $800,000 of capital paid up. Upon the establishment of the national banking system the bank surrendered its State charter and entered the new system as The National City Bank of New York. The efforts of successive management have always been energetically directed toward broadening and perfecting the service of the institution for the accommodation of the rapidly expanding business interests of the United States. Accordingly, in the half-century ending 1 Jan. 1921, the bank's surplus increased 6,000 per cent, its deposits 14,100 per cent and its total resources 14,800 per cent. The statement of condition 30 June 1921 showed capital $40,000,000, surplus and undivided profits $64,460,411.14, deposits $609,665,823.04 and total resources, the greatest of any bank in the Western Hemisphere, $868,046,166.25.

The bank has been active in developing American foreign trade, and was the first American national bank to establish foreign branches. With the International Banking Corporation, which it owns, The National City Bank now has more than 75 branches in all parts of the world.

In June 1921, following its absorption of the Commercial Exchange National Bank, The National City Bank opened three branches in New York City. During the previous 109 years, its sole place of business in New York City had been at its head office, located in Wall street.

In 1911 the directors of the bank declared a special dividend of $10,000,000, this sum becoming the capital of The National City Company, which buys and offers for sale select issues of bonds and short term notes. All of the stock of The National City Company is owned by the stockholders of The National City Bank of New York.

More than 7,000 employes are required to do the work of The National City Bank, The National City Company and the International Banking Corporation in all parts of the world. Connected with the clerical force is the City Bank Club organized in 1904, and now numbering practically all employees as members.

NATIONAL CIVIC FEDERATION, The, an American organization, founded 16 Dec. 1901, the outgrowth of a number of local conventions representing capital and labor. Its purpose is to seek, by an organization of the best thought in the country, a solution of industrial problems; to assist in the enlightening of public opinion through study and discussion of national questions; and to promote progressive social and industrial legislation when it seems desirable. It is entirely non-partisan in principle, considering such topics as imperialism, trusts, tariff, taxation, etc., with a view of obtaining the clearest understanding of them. The Federation is controlled by a national executive committee of three factors: *the public,* represented by the church, the bar, the press, statesmen and men of affairs; *employers,* represented by large manufacturers, corporation heads and officials of employers' organizations; and *labor,* represented by official members of labor organizations. This committee, numbering 54, meets annually, or at such other times and in such localities as may be deemed advisable. Its membership consists of men from all parts and of all occupations of the country, including a large number prominent in the various pursuits of life.

In the natural expansion of its activities the work of the Federation has been very highly organized under nine general departments, as follows: (1) *Trade Agreement Department,* devoted to the advancement of industrial peace; (2) *Industrial Conciliation Department,* dealing particularly with actual or threatened strikes or lockouts, the adjustment of labor disputes by arbitration and the creation of definite contractual relations between employers and employees; (3) *Industrial Economics Department,* devoted to the study and discussion of the practical phases of economics as applied to industrial problems; (4) *Industrial Welfare Department,* with the duty of promoting sanitary working conditions, technical training, housing of employees, the conduct of insurance and pension systems and savings and loan operations, etc.; (5) *Public Employees Welfare Department,* devoted particularly to the economic benefit of that much neglected class of workers; (6) *Public Ownership Commission,* assigned to the study of the results of public ownership of public utilities in all countries; (7) *Immigration Department,* concerned with the questions arising from immigration, governmental regulations and safeguards of the country at large, and individual localities in particular; (8) *Political Reform Department,* devoted to the teaching of practical non-partisan politics, the enlightenment of voters and the promotion of active participation in civic and national politics; (9) *Woman's Department,* in which nearly all the members are women who are actively interested in industrial enterprises as stockholders, and in active welfare work, such as prison reform, rural betterment, community nursing and the like.

Under the general departments there are committees almost without number assigned to carefully deliminated lines of investigation and operation, their members selected especially for notable aptitude in their specific subjects. With the entrance of the United States into the great war, the Federation has found an entirely new series of problems presenting, and its membership has furnished well-equipped minds to attack them intelligently and effectively.

Within recent years the work of the Federation has been intensively developed by the organizations of State councils all over the country, to aid in unifying laws on intrastate matters and to further co-ordination of State and Federal legislation on subjects of public welfare.

At the present moment the industrial economics department has under way a comprehensive survey of social and industrial conditions under 26 separate committees, each composed of members specializing in the particular phase of the investigation to which they are assigned.

The chief mission of the National Civic Federation being educational, one of its most important functions is to give publicity to its labors. This duty is assigned to a bureau of publicity, which besides issuing large numbers of pamphlets and leaflets for general distribution conducts a monthly magazine, *The National Civic Federation Review,* in which is preserved the records of results achieved by the several committees.

NATIONAL CONFERENCE OF CHARITIES AND CORRECTION, an American association composed of State boards of public charities and various charity organizations. The national conference is held each year in some city determined upon at a preceding meeting. At these conferences papers are read and general subjects embraced under charity and correction are discussed. The Conference publishes its *Proceedings* and a *National Bulletin* annually, and maintains a bureau of information on all subjects concerning charities and corrections.

NATIONAL COVENANT, a league formed by Scotch Presbyterians in 1638. See COVENANT.

NATIONAL CONVENTION, in France, a legislative body constituted in the hall of the Tuileries 17 September and formally opened 21 Sept. 1792. The third assembly of the deputies elected by the French people after 1789 decreed the suspension of the king 10 Aug. 1792, and voted the election of this National Convention. Its first act was to make France a republic by abolishing the throne, and this was followed by the trial and sentence to death of the king. Internal dissensions arose between the Jacobin or Montagnard party and the Girondists, resulting in the overthrow of the latter. The convention sent thousands of its political opponents to the guillotine, and the Reign of Terror under the dictatorship of Robespierre was followed by his downfall and the suppression of the Jacobins. The convention then existed till a new constitution was organized, and the executive directory was installed at the Little Luxembourg, 1 Nov. 1795. The Chartists in England formed a national convention in 1839. In the United States a national convention is the meeting once in four years of a political party assembled to select a Presidential ticket. See ELECTION.

NATIONAL CONVENTIONS. See CONVENTION, POLITICAL.

NATIONAL DEBTS OF THE WORLD. Debt incurred by the nations has developed with startling rapidity in recent years. National debts in the year 1700 were, as nearly as can be determined, about $1,000,000,000, and in 1800 approximately $5,000,000,000. By 1900 they had grown to $31,000,000,000. At the beginning of the great European War in 1914 they were about $45,000,000,000, and in 1921 were approximately $325,000,000,000.

The first great increase in national indebtedness of the modern period was that caused by the Napoleonic Wars, which in 15 years increased the national debts of the world from $2,500,000,000 to over $7,000,000,000. From 1814 down to the middle of the century, a period of comparative peace, the growth of the national debts was slow, the total of all the debts of the countries for which statistics are available having been in 1850 approximately 9 billions, a net increase of but about 2 billions in 35 years. Then came the heavy expenses of our own Civil War, also of the Crimean, Franco-Prussian and other wars, and by 1874 the world's total stood at 22½ billion dollars. By 1900 it was 31 billions, and at the beginning of 1914 45 billions. Then with the demands of the European War upon the nations participating the already large total was practically quintupled, advancing from 45 billions in 1914 to about 225 billions in 1919, and this does not include the large sums of paper currency issued by the warring nations to meet such part of their current requirements as they were unable to provide by bond issues.

While wars are usually looked upon as the great cause of the rapid growth of national indebtedness in the past century, a careful consideration of the history of this growth shows that much of the increase prior to 1914 was due to other causes. In the 40 years between 1874 and 1914, in which national indebtedness grew from 22½ billions to 45 billions, there were few costly wars. The great European nations increased their standing armies and navies, this armed peace adding greatly to their expenses and in some cases to their indebtedness. There were, however, other causes. The period was one of great activity in development of the new areas of the world. South America, Africa, Canada, Mexico, Australia and New Zealand show a rapid development in that period, in railways and other transportation facilities, and a large proportion of such development was met by the governments, which necessarily contracted large loans for that purpose. In many of the European countries great railway systems were developed at government expense, which necessitated large borrowings. The railways of the whole world in 1874 were about 150,000 miles, and in 1914 over 700,000 miles, of which about one-third was government owned. Telegraphs, owned in most countries by the government were in 1874 but 300,000 miles and in 1914 1,500,000 miles. Many public improvements other than railways and telegraphs were also made at public expense. Harbors were deepened, rivers made navigable, inter-oceanic canals created, great and costly buildings erected and as the debt grew, so did the burden of interest.

Other causes, however, contributed largely to the «debt habit» among nations. Among these contributive factors were the increase of world money, and increase of wealth, which made borrowing by nations comparatively easy when contrasted with earlier conditions. Down to 1848 the world's production of gold was but about 12 million dollars per annum, in 1860 it was 122 millions per annum, in 1900 it amounted to 254 millions and in 1913 to 460 millions. The total money of the world, gold, silver and uncovered paper, as estimated by competent authorities, was in 1800 about 2½ billion dollars, in 1850 a little over 4 billions, but by 1900 had grown to 12 billions, and in 1913 was 18 billions. The world's money — gold, silver and uncovered paper — practically trebled in the 40 years in which the national debts doubled and this increase in available currency encouraged the borrowing habit among nations. With the entrance upon the European War the issues of paper currency rapidly increased, the paper money issued by 15 responsible governments of the world during the war period aggregating $36,000,000,000; and during that same period national debts increased $180,000,000,000, bringing the total national indebtedness up to $225,000,000,000 in 1919.

The quantity of available wealth to which nations might appeal was another temptation.

Borrowing became comparatively easy. It is quite impossible, of course, to accurately measure the wealth of the entire world, especially at the earlier dates under consideration, for even at the present time we can only estimate the wealth of a score of the principal nations, but an examination of the wealth figures of a few countries for which data for earlier years can be had shows an extremely rapid growth in the last 40 years, and suggests that the available wealth of the world upon which the nations requiring loans were able to draw had very greatly increased during that period in which they developed great debts for other than war purposes. The wealth of the United Kingdom, for example, is estimated as having been about 30 billion dollars in 1865 against 90 billions in 1914; that of France is estimated at 25 billions in 1865 and 65 billions in 1914. Thus the wealth of these two fairly representative countries of Europe, speaking in broad terms, trebled in the half century immediately preceding the World War. In the case of the United States, a newer country and having special facilities for the increase of its wealth through the development of its producing powers, the rate of growth has been much greater, increasing from 16 billion dollars in 1860 to approximately 200 billions in 1914, our own wealth having been in 1914 fully 12 times as much as in 1860, a rate which could not of course be applied to the world as a whole. In certain other countries, Canada, Australia, South Africa and parts of South America, the gain was also rapid, but the rate of growth of the world's wealth is fairly exemplified by that of France and Great Britain, and it seems probable that the world's available wealth practically trebled in that 40-year period, in which the nations of the world were doubling their national indebtedness in times of comparative peace.

The purposes to which the increase in debts was devoted are not difficult to find. A half century ago the world was calling for railroads, steamships, inter-oceanic canals, better harbors, waterways on land, telegraphs and ocean cables to further facilitate intercommunications and the interchange of merchandise and its equivalent, money and credits. About one-third of the railways of the world are now governmentally owned, and have been largely paid for by borrowed money. Of the 220,000 miles of railway in Europe about 120,000 are government owned; of the 70,000 in Asia, 45,000 belong to the governments of the countries in which they exist; of the 28,000 miles in Africa about 17,000 are owned by the governments of the respective colonies into which that continent has been divided or by the governments of the countries controlling those colonies; of the 23,000 miles in Australia over 20,000 were constructed by the government, while of the 360,000 miles in America only about 10 per cent are government owned. A large part of the railways of Russia, Germany, Austria-Hungary, Italy, Egypt, India, Japan, Australia, New Zealand and the Dutch East Indies are owned and in most cases operated by the respective governments. All of the telegraph lines of the world, except those in the United States, are owned by the governments of the countries in which they operate. When we add to this the cost of the great undertakings in water transportation, inter-oceanic canals, harbors, inland canals and the deepening of rivers it will be apparent that the mere matter of transportation has absorbed a very considerable part of the indebtedness accumulated in the half century prior to 1914.

While much of the growth of national debts between the great war periods was for legitimate improvements in transportation and world progress, it must be admitted that the preparations for possible wars had much to do with the large national expenditures which encouraged the debt habit. During the 40-year period of debt making without war the countries of Europe built up and maintained as a permanent part of their establishments enormous standing armies, which not only withdrew large numbers of persons from the productive industries, but required large sums of money for their equipment and maintenance, and at the same time they greatly enlarged their navies, and this was undoubtedly one of the important causes of the very large increase in the world's accumulation of indebtedness during the period 1874–1914, in which world debts doubled in a time of comparative peace. The 1913 debts of the European countries were in round terms $32,000,000,000, Asia $4,000,000,000, South America $2,300,000,000, North America $2,100,000,000, Africa $1,500,000,000 and Oceania $2,000,000,000. Of the world's national debts in 1874, which aggregated at that time about 22½ billion dollars, about 15 billions were owned by European countries, and the remainder distributed among the other grand divisions, that of North America alone being approximately 3 billion dollars.

Of the 45 billion dollars of national debts in existence at the beginning of the year 1914 about 34 billion dollars were owed by the countries which entered the war. France stood at the head of the list with an indebtedness of $6,346,000,000; Germany (including the German states), $5,027,000,000; Russia, $4,536,000,000; Austria-Hungary, $3,869,000,000; United Kingdom, $3,486,000,000; Italy, $2,921,000,000; Australia, $1,433,000,000; Japan, $1,241,000,000; United States, $1,028,000,000; Portugal, $948,000,000; Belgium, $826,000,000; Turkey, $624,000,000; Canada, $483,000,000; New Zealand, $438,000,000; Rumania, $316,000,000; Bulgaria, $135,000,000. This list of countries whose total debts at the beginning of the war were $33,657,000,000 includes only those which actively participated in the fighting, and in the war period they practically sextupled their indebtedness as shown by the tabular statement which follows this discussion.

The relation of national debts to national wealth is of course of great importance, but can only be discussed in very general terms, owing to the fact already mentioned, that no country other than the United States takes a wealth census, and figures on the wealth of other countries are at the best only estimates; while figures as to income of a country are therefore estimates based on estimates. Accepting estimates which have been made of the wealth of the principal countries in 1919 it would appear that the ratio of debt to wealth in 1919 would be in case of the United States about 8 per cent, Great Britain, France and Italy 33 per cent. The per capita indebtedness of the principal countries in 1919 is: United States, $223;

Great Britain, $790; France, $800; Germany, $675; Italy, $350.

Practically all of the loans made by the great nations of Europe have been issued by the governments at less than their face or par value. The first of the British war loans in the great European War (that of November 1914) which bore an interest rate of 3½ per cent was issued by the government at 95 per cent, or at 5 per cent below par; a part of the third was issued at par and a part at 95 per cent. The German loans were issued at slightly below par, 97½ per cent in some cases, 98 per cent in others and 99 per cent in one instance; those of Italy at from 90 to 97 per cent of their face value, while in the case of France the first National Defense Loan bore an interest rate of 5½ per cent and was sold by the government at 88 per cent of its face value, and in the second loan, which bore an interest rate of 5 per cent, the issue was made at 88 per cent while a still later loan was issued at about 70 per cent of its face value, the Austria-Hungary loans which bore interest at the rate of 5½ per cent in most cases were issued at from 93 to 97 per cent of their face value. As a result of this the amount of money which European governments have actually received upon their loans issued since the beginning of the war is nearly 3 billion dollars below the par value of the securities issued, upon which par value the present generation must pay full interest while the later generations who meet the principal of the bonds will have to pay approximately 3 billion dollars more than was received by the governments which issued them. The United States is in fact the only one of the great nations making popular loans in behalf of the war which actually sold its bonds at their full face value. And many of the securities of the European countries sold at less than par have also been paid for in a paper currency more or less depreciated.

A very large proportion of the national loans issued by governments other than the United States in former years were also sold by the issuing governments at less than their face value, in most cases at from 2 to 5 per cent below par.

Loans made by the United States government have usually been issued at their full face value. In the very early days there were a few exceptions to this general rule. A 22-year bond issued in 1796 was sold at 87½ per cent of its face value; a 16-million dollar issue in 1813 was sold at 88 per cent; another in August of that year at 11¾ per cent discount, and in 1814 sundry issues at a discount of 20 per cent. Again in 1842 there was one small issue at 97½ per cent, and in 1861 two larger issues at 89 per cent of their face values. During the Civil War apparently all of the numerous bond issues made by the government were sold at par, and in a few cases above par, but were paid for in the depreciated currency of that period—greenbacks—which were accepted at their face value.

Of the world's national debts which existed at the beginning of 1914 a large part were held in Europe, and practically all of those issued after 1914, aside from those of the United States, were taken in Europe. Of the total of the world's national debts at the beginning of 1914, 45 billion dollars, about 32 billions were the obligations of European governments, approximately 4 billions those of Asiatic governments, 2¼ billions South American, 2 billions Oceania and 1¼ billions Africa. Practically all of the European government issues, amounting to 32 billion dollars, were then held in Europe, most of them in the countries by which they were issued, except in the case of Russia, Italy, Spain, Portugal and certain of the Balkan States. A very considerable proportion of the Russian securities aggregating about 4½ billion dollars at the beginning of the war were held in France, Germany and Great Britain, and this was true to a considerable extent of those of Italy, Spain, Portugal and the Balkan States. Of the South American securities, a large proportion were held in Great Britain and France. Those of North America were chiefly held at home; those of Asia in part in Great Britain, France and Germany, but a considerable share was held in Asia, while those of the British colonies in Africa and Oceania were largely held in Great Britain. Practically all of the great loans made by the European countries since 1914 (with the exception of the $500,000,000 marketed by the British and French in the United States) were placed among the people of the country issuing them, in the form of «popular loans,» though some parts of the early Russian loans were probably taken in Great Britain and France. This fact, that most of the obligations of the nations are held by their own people, is the one mitigating feature of the enormous increase in national indebtedness of today. The payment of the debts will not send out of the country the money so paid, while the greatly increased interest payments are also distributed among home population.

NATIONAL DEBTS OF THE WORLD.

1700.......	$1,000,000,000	1882.....	$26,300,000,000
1790.......	2,300,000,000	1900.....	31,200,000,000
1820.......	7,400,000,000	1913.....	43,850,000,000
1848.......	8,400,000,000	1917....	120,000,000,000
1862.......	13,500,000,000	1921....	325,000,000,000
1872.......	22,500,000,000		

NATIONAL DEBTS OF THE PRINCIPAL COUNTRIES PARTICIPATING IN THE EUROPEAN WAR OF 1914.

COUNTRIES	1913	1919
United States.......	$1,103,000,000	$26,116,000,000
Great Britain........	3,444,000,000	37,985,000,000
British colonies:		
Canada...........	544,000,000	1,796,000,000
Australia.........	182,000,000	1,420,000,000
India.............	1,470,000,000	2,225,000,000
New Zealand......	487,000,000	756,000,000
South Africa......	614,000,000	774,000,000
France...............	6,346,000,000	34,842,000,000
Russia...............	4,537,000,000	*25,750,000,000
Italy.................	2,921,000,000	15,600,000,000
Belgium.............	156,000,000	4,000,000,000
Germany...........	1,194,000,000	41,150,000,000
Austria-Hungary.....	1,044,000,000	25,799,000,000
Turkey..............	843,000,000	1,485,000,000
Bulgaria.............	223,000,000	486,000,000
Totals.........	$25,108,000,000	$220,184,000,000

The above figures do not include debts of the German states, the Australian colonies prior to incorporation as the Commonwealth of Australia, or the separate pre-war debts of the Austrain Empire and Hungarian kingdom.

* October, 1917.

O. P. AUSTIN,
Statistician, National City Bank, New York.

NATIONAL EDUCATION, Systems of. See EDUCATION, NATIONAL SYSTEMS OF.

NATIONAL EDUCATION ASSOCIATION, since 1870 the name adopted for the National Teachers' Association founded at Philadelphia, Pa., in 1857, an organization composed of teachers and other persons interested in education. Its purpose is the discussion of topics relating to the education of the whole people, to the end that the profession of teaching may be elevated in its character, that its interests may be advanced and that the cause that it represents may be promoted in the United States. The Association exists as a body corporate of the District of Columbia, under the name of the National Education Association of the United States, by virtue of an act of incorporation passed by Congress and approved by the President 30 June 1906.

Section 2 of the act provides that «This corporation shall include the National Council of Education and the following departments, and such others as shall be created by organization or consolidation, to-wit: the departments (1) of superintendence; (2) of normal schools; (3) of elementary education; (4) of higher education; (5) of manual training; (6) of art education; (7) of kinder education; (8) of music education; (9) of secondary education; (10) of business education; (11) of child study; (12) of physical education; (13) of natural science instruction; (14) of school administration; (15) the library department; (16) of special education, and (17) of Indian education, the powers and duties and the number and names of these departments and of the National Council of Education may be changed or abolished at the pleasure of the corporation, as provided in its by-laws.»

The membership consists of three classes: active, corresponding and associate members. Any eligible person may become an active member upon application endorsed by two active members by paying an enrolment fee of $2 and the annual dues of $2 for the current year. Teachers and all who are actively associated with the management of educational institutions, including libraries and educational publications, are eligible for active membership. Only active members have the right to vote and to hold office. All active members are entitled to a volume of the *Proceedings.* Corresponding members, whose number shall not exceed 50 at one time, shall be eminent educators not residing in America. They shall be elected by the board of directors and shall receive the volume of *Proceedings* without the payment of any fee. Associate members pay an annual fee of $2 and may receive the volume of *Proceedings* by formal application. The board of trustees consists of four members, elected by the board of directors for a term of four years and the president of the Association, who is ex officio a member during his term of office. The details of officers and of management may be found in full in the *Proceedings* (1906 et seq.). The several departments engage in the special work of education which their names indicate. The National Council of Education is a deliberative body, whose functions need brief elaboration. One of them is the proposal to the board of directors of suitable subjects of investigation and research and the recommendation of the amount of money that should be appropriated for that purpose. When the board of directors authorizes special studies and investigations the council selects the membership of the committees to make them. Several important reports have issued from such committees and may be obtained by correspondence with the secretary of the Association. The council consists of 60 members, selected from the membership of the Association. The board of directors annually elects five members and the council the same number, each to serve for six years and until their successors are elected. All members become honorary members on the expiration of the terms for which they are elected. They are privileged to attend the sessions of the council and participate in its discussions. No State is entitled to more than eight members.

History.— The Association was organized in 1857 as the National Teachers' Association. It was an extension of the State association idea to the country at large. To T. W. Valentine, president of the State Teachers' Association of New York, belongs the credit of initiating the movement. In conference with D. B. Hagar, of the Massachusetts Association, a call for a convention was agreed upon and prepared by the latter in 1856, in pursuance of which a small number of men gathered in Philadelphia 26 Aug. 1857. At this meeting the National Teachers' Association was founded with Zalmon Richards of Washington, D. C., as president. There were 43 members enrolled but 12 States and the District of Columbia were represented. At the Indianapolis meeting of 1866, the word «person» was substituted for «gentleman,» in the section defining eligibility for membership. Women were thus admitted to full membership. Meetings were held annually in the different States and before 1870 all discussions were held before the whole Association as a body. In that year the department feature of the Association was introduced and the name changed to the National Education Association. Some of the departments had existed previously as independent associations. This was true of the department of normal schools, formerly the American Normal School Association, and organized at Norwich, Conn., in August 1858 and of the department of superintendence, which was previously the National Association of School Superintendents, organized at Harrisburg, Pa., in August 1865. Although the Association drew its membership from all parts of the country the attendance at its meetings was small, never reaching the 400 mark in the first quarter century of its existence. The 1884 meeting was the turning point in the fortunes of the organization. The financial difficulties had been extremely embarrassing. It had been impossible to print the addresses without contributions from liberally disposed members. The president for that year, Thomas W. Bicknell, conceived a plan of enlisting the interest of the railway people and the days of poverty were a matter of history. The enrolment reached 2,729. The Association was freed from debt and a permanent fund started. While the number varied widely in succeeding years, it has steadily increased, the most remarkable record being that at the Boston meeting of 1903, at which 34,983 members were enrolled.

The movement to secure a permanent membership was inaugurated at the Denver meeting in 1895. The old scheme by which one could purchase a life membership for $20 and a life directorship for $100 was abolished. In its stead, the present plan of the payment of annual dues, whether in attendance at the meeting or not, was adopted. In consequence the society now has a permanent membership of about 10,000 active, and a far greater number of associate members. Since 1898 a permanent secretary is employed by the board of trustees. He is chosen for a term of four years. Reference has been made to the special studies that have been conducted in an exhaustive way by committees composed of experts in the subjects under consideration. They are among the most notable publications of the Association. The following reports, among others, have been widely circulated and have had no little influence in determining policies in the fields which they cover: of the Committee of Fifteen on ‘Elementary Education’; of the Committee of Ten on ‘Secondary Studies’; of the Committee of Twelve on ‘Rural Schools’; of the Committee on ‘Salaries, Tenure of Office and Pensions of Teachers,’ on ‘Taxation as Related to Public Education.’ The permanent invested fund of the Association amounts at present to $188,500, yielding a net revenue of $7,178. The annual receipts in a recent year amounted to $42,529; the expenses, $37,158. Consult ‘History of the National Education Association of the United States’ (Washington, D. C., 1892); the ‘Annual Report,’ ‘Proceedings,’ etc., of the Association; the most important publications on pedagogy now in the United States; the ‘Reports’ of committees referred to above.

NATIONAL EXPANSION. See United States, Territorial Expansion; Annexation; Colonies and Colonization.

NATIONAL FARMERS' ALLIANCE. See Farmers' Alliance.

NATIONAL FORESTS. See Forestry in the United States.

NATIONAL GALLERY, The, the British national art gallery; a collection of paintings, in Trafalgar Square, London. It originated in a collection formed by Mr. Angerstein, consisting of 38 pictures, 29 by old masters and 9 by British painters, and purchased with public funds in 1824 for $280,000 as the nucleus of a national gallery. Since that time the collection has been greatly enlarged by purchases out of funds provided by Parliament, as well as by bequests and gifts. Of the latter the most munificent has been that of Mr. Vernon in 1847, a collection of 157 works of English painters. Another highly valuable section is that of the pictures and drawings by Turner bequeathed to the nation at his death in 1856. In 1871 a valuable prize was secured by the purchase for $375,000 of Sir Robert Peel's collection, consisting of 77 paintings and 18 drawings. In 1885 Parliament voted $350,000 for the purchase of a single picture, the ‘Ansidei Raphael,’ together with $87,500 for another, Van Dyck's ‘Charles I on Horseback.’ The National Gallery now comprises over 1,200 pictures and though specially strong in examples of the British school of painting, foreign masters are fully represented. The various early and late Italian schools are extensively illustrated; there are good examples of the chief representatives of Italian art, as Raphael, Correggio, Paul Veronese. There are also good examples of Murillo and Velasquez and the Spanish school, and the great Dutch and Flemish painters, Rembrandt, Rubens, Van Dyck, etc., are well represented. The original building of the National Gallery dates from 1838 but has since had additions to accommodate the increasing collection.

NATIONAL GEOGRAPHICAL SOCIETY. See Geographical Society, National.

NATIONAL GOVERNMENT AND CORPORATIONS. See Corporations, Legal.

NATIONAL GRANGES. See Grangers; and Granger Cases.

NATIONAL GUARD. See Militia.

NATIONAL HYMNS. A national hymn as usually understood is the official song rendered on ceremonial occasions, fêtes and other public gatherings. It is sometimes an air (without words) that is recognized by the government, a march played by bands and orchestras to stimulate patriotism and loyalty to the ruler. While the oldest of national hymns now extant date back less than five centuries, lines breathing the spirit of patriotism were written by Horace and other poets of ancient times. The national song is intimately related with and probably grew out of the folksong. Words and music should convey something of the national temper, should voice the aspiration of a people and express to some extent the ideas that a nation stands for. Love of fatherland and pride in one's country are the keynotes of many national anthems. In some of them religious feeling is blended with patriotic sentiment. The tune as well as the lyric should be by a native composer. In Europe the writers of national hymns have usually been enlisted in the service of institutionalism. Their productions have been often inspired by devotion to church and state, also by love of home. Considering the lack of poetical merit in most national songs, their influence has been very great. Wars and revolutions have sometimes called them into being and in these especially the note of freedom is emphasized.

Argentina.—‘Oid, mortales, el grite sagrado’ (1810) (Hear, O mortals, The Sacred Call.’ Music is by D. V. Lopez.

Austria.— The Austrian national hymn in the days of the empire, ‘Gott erhalte unsern Kaiser,’ or, according to the monarch's name, ‘Gott erhalte Franz den Kaiser,’ was written in 1797 by Laurence L. Haschka (1749–1827); music by Joseph Haydn (1732–1809). A stanza is quoted:

God preserve our Franz in glory, Franz our Emp'ror good and great!
High in wisdom, famed in story, we his praises celebrate;
Love of subjects young and hoary bind his crown of regal state,
God preserve our Franz in glory, Franz our Emp'ror good and great!

Belgium.— The Belgian national hymn is ‘La Brabançonne’ (the Song of the Brabantines); music by François van Campenhout (1780–1848). The words were written by Jenneval, a French comedian, who was playing in a theatre of Brussels when the rising took place which resulted in Belgium's independence from Dutch rule in 1830. The refrain plays on the word “orange,” referring to the reigning house of Orange in the Netherlands. The first stanza is appended:

Who would have thought the arbitrary
And scheming despot would bring force?
Against us comes a sanguinary
Princeling, with shrapnel in his course.
'Tis done, o'er Belgians comes a change.
No more with Nassau shameful pact shall be.
The grape-shot's shattered the orange
Upon the tree of liberty.

Three other versions of ‹La Brabançonne› were written — that by Lonlay in 1848, another by Campenhout and one by Hymans in 1852 — relating to the political situation in those years.

Bohemia.— Bohemia has two well-known national songs, the ‹War-song of the Hussites› (dating back to about 1460) and ‹My Fatherland,› composed centuries ago. The names of author and composer are forgotten. The first stanza of this favorite national ditty is:

Where is my house? Where is my home?
Streams among the meadows creeping,
Brooks from rock to rock are leaping,
Everywhere bloom spring and flowers,
Within this paradise of ours;
There, 'tis there, the beauteous land!
Bohemia, my fatherland!

Bolivia.— Words by J. I. de Sanjines and music by B. Vincenti.

Brazil.— Words by Medeiros Albuquerque and music by L. Miquez.

Burma.—‹Kayah Than› (Sound the Trumpet).

Canada.—‹The Maple Leaf Forever,› words and music by Alexander Muir.

Chile.—‹Dulce Patria› by Carnicer.

Costa Rica.—‹De la Patria› by M. M. Gutierrez.

Denmark.— The Danish national hymn, ‹Kong Christian stod ved höjen mast› (King Christian stood beside the mast), was written by Johannes Evald (1743–81); music adapted from an old air by John Hartmann (d. 1793), a German who settled in Copenhagen in 1768. Longfellow's version of this spirited poem is well known.

Ecuador.—‹Salve, O Patria.›

Egypt.—‹Salaam Effendi› (March of the Khedive).

Finland.—‹Vårt Land› (Our Land). Words by J. L. Runeberg; music by F. Pacius.

France.— The history of ‹La Marseillaise,› the most famous of all national hymns, is dealt with elsewhere. See MARSEILLAISE.

The national hymn of the Second Empire (1852–70) was ‹Partant pour la Syrie›; words by A. de Laborde and music by Queen Hortense.

Germany.— Germany's national hymn, ‹Die Wacht am Rhein› (The Watch on the Rhine), is treated under that head (q.v.). A national song very popular among Germans is ‹Deutschland über Alles,› written in 1841 by August H. Hoffmann (1798–1874), generally known as Hoffmann von Fallersleben. It is sung to the music of the Austrian national hymn. The first stanza of ‹Das Lied der Deutschen› is thus translated:

German Empire over all things, over all things in the world,
When for safety and defiance its proud banner is unfurled,
From the Maas unto the Memel, from the Etsch to sea waves curled —
German Empire over all things, over all things in the world!

The Prussian national hymn is ‹Heil dir im Siegerkranz› (Hail to thee laurelcrowned), written in 1790 by Heinrich Harries (1762–1802). It is sung to the tune of ‹God Save the King.› A general favorite is ‹Preussenlied› (Song of the Prussians), written in 1830 by Bernhard Thiersch (1794–1855); melody composed in 1839 by H. A. Neithardt (1793–1861). The Bavarian hymn is ‹Heil unserm König, Heil› (Hail to our monarch, hail).

Great Britain.— The British national hymn, ‹God Save the King,› was composed in 1739 by Henry Carey (1692–1743), who was partly indebted to others for the words. He borrowed and rewrote the air from the French. The music has been adapted for the national hymns of the United States, Switzerland, Prussia and other German states. *Welsh.*—‹Hen Wlad Fy Nhadan› (Land of my Fathers), was written by Evan James; melody by James James. The first stanza, as translated by Eben Vardd, is as follows:

The land of my fathers, the land of my choice,
The land in which poets and minstrels rejoice;
The land whose stern warriors were true to the core,
While bleeding for freedom of yore.

Among the patriotic songs of various parts of the British Empire are ‹The Song of Australia› (words by Mrs. C. J. Carleton and music by Carl Linger) and Canada's ‹Maple-leaf Forever› (music by A. Muir).

Greece.— The Greek national hymn is the war song, ‹Sons of Greece, come, arise,› which dates back to the days of the Greek struggle for independence (1821–29). Byron translated it.

Guatemala.— Words by P. Molina and air by R. Alvarez.

Hebrew.— The songs of the Hebrew nationalists is ‹Hatikva.›

Honduras.— Music by L. Campos.

Hungary.—Among the patriotic songs of Hungary the one most frequently heard is ‹Isten åldd meg a Magyart› (Lord, bless the Hungarian) by F. Koseley, which is wed to a striking melody. The renowned ‹Rákoczy March,› by an unknown composer, has even greater power over Hungarians.

Ireland.— The patriotic songs of the Irish have for their themes episodes in the glorious but tragic history of the race. A song still popular is ‹The Wearing of the Green,› dealing with the rebellion of 1798. In the latter half of the 19th century it was supplanted somewhat in popular favor by T. D. Sullivan's ‹God Save Ireland› (1867). The new century and the new nationalism have produced the stirring call to freedom in the native tongue, ‹Sinn Fein Linn Fein mar Iadsan,› now only rivaled by the popular ballad, ‹Who Fears to Speak of Easter Week,› dealing with the rising of Easter Week (24 April–1 May 1916).

Italy.— The only national air of Italy is Gabetti's ‹Marcia Reale Italiana› (Royal Italian March), played on all official occasions. The famed Garibaldi's ‹Hymn› (q.v.) is a martial strain, and the other patriotic songs are sectional.

Japan.— The Oriental national airs are very simple. That of Japan ‹Kimi Ga Yo Wa,› by Hayashi Hiromori, contains four lines:

Let Mikado's empire stand
Till a thousand years, ten thousand years shall roll,
Till the sand in the brooklets grow to stone,
And the moss these pebbles emeralds make.

The Japanese have borrowed G. F. Root's ‹Battle Cry of Freedom.›

Mexico.— The Mexican national hymn, ‘Mexicanos, al grito de guerra’ (Mexicans, at the cry of war), was written by F. G. Bocanegra; air composed in 1853 by James Nunó.

Mohammedan.— Some Mohammedan countries of Africa have sultans' hymns. The national air of Liberia is by Olmstead Luca.

Montenegro.—‘Onward! Onward!’

Netherlands.— Holland has two national songs that are often sung on public occasions — ‘Wilhelmus van Nassouwe’ (dating back to about 1568) and ‘Wein Neerlandsch Bloed.’ The latter hymn, by H. C. Tollens (1778–1856), begins:

Let him in whom old Dutch blood flows,
  Untainted, free and strong;
Whose heart for Prince and country glows,
  Now join us in our song;
Let him with us lift up his voice,
  And sing in patriot band,
The song at which all hearts rejoice,
  For Prince and Fatherland!

The *Boer* national hymn is by Catherine F. Van Rees, who wrote both words and music. There are three stanzas, of which the first runs as follows:

Know'st thou a race, of freemen bred,
  Who broke the tyrant's might;
Who burst their bonds and fought and bled
  For freedom and for right?
Come, burghers! Raise the flag on high
  That led to victory;
The hour of bondage has gone by —
  Free men, free men are we!

There are two stanzas in the national hymn of the Orange Free State; words by H. A. L. Hammelsberg and music by W. F. G. Nicolai.

Nicarauga.— Music by Blas Villatas.

Norway.— The Norwegian national hymn is ‘Sang for Norge’ (Song for Norway), written in 1859 by Björnstjerne Björnson. Three stanzas of this admirable lyric have been translated by Rasmus B. Anderson. The first is:

Yes, we love with fond devotion
  Norway's mountain domes,
Rising storm-lashed, o'er the ocean,
  With their thousand homes;
Love our country, while we're bending
  Thoughts to fathers grand,
And to saga-night that's sending
  Dreams upon our land.

Another patriotic song is ‘Sönner af Norge’ (Sons of Norway), by H. A. Bjerregaard (1792–1842); music by C. Blom (1782–1861).

Persia.—‘Salmati Shah.’ Music by A. Lemaire.

Peru.—‘Somos libres, seámoslo siempre’ (We Are Free, Let Us Be So Forever).

Poland.— Besides the Polish song referred to under Russia (below) the Poles have a national song entitled ‘God for Poland.’

Portugal.— Portugal's national hymn is the ‘Hymno Constitucional,’ written about 1861 by Dom Pedro I, emperor of Brazil. Upon the accession of Don Carlos I (21 Dec. 1889), a new national air was composed by H. M. Jurior.

Rumania.— In 1861 the Rumanian government offered a prize for the best national hymn, which was won by V. Alexandri's stanzas, ‘Traeasca Regale’ (Long live the king); music by E. A. Hübsch.

Russia.— The former Russian national hymn, ‘Bozhe Zaria Chrany’ (God preserve the Tzar), written by Jukovsky, is a prayer. The air by Alexis Lvoff dates from 1830, when Nicholas I ordered it sung as the national anthem. The revolt of 1830 produced the stirring battle song by Wybitski, ‘Poland's not yet dead in slavery,’ which has been called the Polish national hymn.

Salvador.—‘Saludemos la Patria’ (Let Us Hail Our Country). Words by J. J. Canas; music by J. Aberle.

Serbia.— Serbia has two: ‘Rise, Oh Serbians’; and ‘God in His Goodness,’ set to music by D. Jenko.

Spain.— The Spanish national air is the fine ‘Hymno de Riego,’ by Huerta (1803–80).

Sweden.— The Swedish national hymn is ‘Ur Svenska Hjertans’ (From the depths of Swedish Hearts); words by Strandberg; music by Lindblad. Equally popular is ‘Fosterjorden’ (Land of my Birth), by Richard Dybeck (1811–77); melody from Jemtland (a province in western Sweden) arranged by J. N. Ahlstrom. C. T. Hanson's translation is:

Oh, ancient beloved Northland of my birth,
  The happiest of nations though lowly,
I greet thee, most beauteous land upon earth,
  Thy green hills, thy sun, thy heaven blue and holy.

The thought of thee brings back the days that are gone,
  The same in thy royal beauty ever,
O'er all lands and seas thy sweet name is borne,
  Oh, I would live among thy hills forever!

Switzerland.— The Swiss national hymn, ‘Dem Vaterland’ (To the Fatherland), by J. R. Wyss (1781–1830), is sung to the tune of ‘America.’ The first stanza of this inspiring lyric is

Call'st thou, my Fatherland?
See us with heart and hand
  Vowed to thee, all!
Helvetia, hail to thee!
True still thy sons shall be,
Like them Saint James did see
  Leap at war's call!

Turkey.— Turkey has no national hymn. Each sultan has an imperial air composed in his honor. There are several Ottoman war songs full of national feeling.

United States.— The national anthem of the United States is the ‘Star Spangled Banner’ (q.v.) written in 1814 by Francis S. Key. The melody is that of an old drinking song. Other patriotic songs that divide honors with it are: ‘Hail, Columbia’ (1798), by Joseph Hopkinson (1770–1842), sung to music composed by Fyles in 1788; and S. F. Smith's ‘America,’ written in 1832 to fit the air of ‘God Save the King.’ It is now generally conceded that ‘Yankee Doodle’ is the true national American air. Its origin is obscure. The most probable account ascribes to the tune an English origin and the words of Dr. Shuckburgh, an army surgeon, about 1755, soon after which, during the American Revolution, it came extensively into vogue. Other popular American national songs are ‘John Brown's Body’ and ‘Dixie.’

Uruguay.—‘Himmo Nacional de la República Oriental del Uruguay.’

Venezuela.—‘Gloria al bravo pueblo’ (1811) (Honor to a Brave Nation). Words by V. Salvias, music by J. Sandaeta.

Consult Bantock, G., ‘Sixty Patriotic Songs of All Nations’ (Boston 1913); Smith, ‘Music of the Waters’; Smith, ‘Stories of Great National Songs’; Fitzgerald, ‘Stories of Famous Songs’; Sousa, J. P., ‘National Patriotic and Typical Airs of All Lands’ (Philadelphia 1890); Kappey, ‘Songs of Eastern Europe’; Engel, ‘Study of National Music’; White, ‘National Hymns.’

NATIONAL IDEALS IN THE WAR. In the strain of the great war the national ideals of all the peoples were severely tested. Articles of political faith previously accepted without much question were challenged to defend themselves in the face of a new criticism and of directly antagonistic ideals. And this warfare of ideals was no mere «battle of the books»; it was fought with machine guns and heavy artillery, with dreadnaughts and submarines, with battle-planes and poison gases. Once again, as so often in the past, men asked themselves what were the essential principles for which they were ready to make the supreme sacrifice? Thus the war made necessary a thorough reconsideration of national ideals.

President Wilson's war message was read to Congress almost exactly 52 years after the surrender of Lee's army at Appomattox. More than half a century, therefore, had passed since the last conflict which seriously tested the *morale* of the American people. With few exceptions the generation which knew at first hand the real meaning of that struggle — what it involved for the civilian as well as the soldier — had passed away. Among those in youth and middle life, there was little appreciation of the responsibilities and the sacrifices by which the national fabric had been established and maintained. Furthermore the issues of the great war were such as to demand of the citizen a quite unusual capacity to see the interest of his country in matters lying beyond his ordinary horizon, an ability to take long views, which has rarely, if ever, been demanded of any democratic community. The rights of the United States had indeed been seriously invaded, but the enemy seemed very far off. It was not enough to depend upon the primitive instinct which calls men to the defense of their own home against a pressing danger. The patriotism of Americans was not stirred, like that of France, by hostile armies upon the actual soil of their country. The appeal was rather, in a quite unusual degree, to permanent, as distinguished from immediate, interests, to ideal, rather than purely material, gains.

National Ideals on the Eve of the War.— The foundation of American political thought is the old English tradition of self-government and representative institutions — the right of the people to a share in their own government. With the coming of independence, this ideal was broadened into a more absolute doctrine of popular sovereignty, now interpreted to mean literally that governmental authority of every kind must proceed directly or indirectly from the qualified voters. In the century that followed, the application of this principle was carried much farther than was expected or desired by the founders of the republic. Notwithstanding important variations in practice, the orthodox American doctrine came to be that of individual manhood suffrage. Restrictions based on color disappeared in theory, if not in practice. A large number of women had already secured the suffrage by State action before 1914 and the movement for equal suffrage by an amendment to the Federal constitution was gaining headway.

In other respects also 20th century American democracy is far more radical than that of the fathers. The framers of the early State governments and of the Federal Constitution were much occupied with the dangers, as well as the advantages, of popular government. Their remedy for ultra-radicalism was the system of «checks and balances» and the frequent use of indirect elections, notably in the Federal Constitution. The President was to be chosen by electors exercising a real discretion; senators were elected by the State legislatures, who also had in many instances the choice of governors and other State officers; even State constitutions were put into effect without ratification by the voters. Gradually the scope of direct action by the voters was extended. Presidential electors became merely counters; governors were everywhere chosen by popular vote; and even that safeguard of conservatism, the Senate of the United States, was brought within the scope of the same principle. From elections the principle was extended to nominations through the system of direct primaries for the choice of party candidates and committees. The voters also sought to exercise a closer control upon the process of legislation by the initiative and referendum; and there have been numerous protests against judicial action declaring unconstitutional measures approved by public opinion. In short, American democracy of the 20th century is far more absolute in its scope, more impatient of restrictions upon the immediate execution of the popular will than that of 1776 or 1789.

With this advance in political democracy there has developed a different way of thinking about the sphere of government in general. The radical democrats of the 18th century were chiefly anxious to free individual energy from the restraints imposed by the old arbitrary governments. America seemed a land of boundless resources; on the frontier, especially, equality of opportunity seemed to ensure the maintenance of a democratic society as well as a democratic government. By the end of the 19th century this optimistic faith in *laissez-faire* was much shaken. The free play of individual energy brought unexpected results, antagonistic to democracy rather than favorable to it. Resources, apparently inexhaustible and open to every one, were seen to be limited after all, and more and more coming to be concentrated in the hands of a comparatively few individuals and corporations. To conserve these resources and ensure their use in the public interest, democratic control must be extended more largely, in the economic, as well as the political, sphere. Many men who might otherwise have clung to the old *laissez-faire* type of democracy were reconciled to the new policies by realizing that in the long run democracy in government rests upon some approximation to equality and democracy in the social order. Undue concentration of economic power must in the end produce an undesirable distribution of political influence. This new type of democracy found expression in statutes regulating commerce, industry, transportation and labor conditions; also in many new administrative divisions, charged with the oversight and control of individual and corporate business.

Not only was the new democracy more ready to use governmental agencies for the promotion of economic and social ends; it was also adjusting itself to greater centralization. The State sovereignty idea, already weakened by the Civil War, was even more seriously undermined by the industrial development of the next half century. The great corporations which controlled transportation, commerce, manufactures and finance could not be dealt with on a purely state basis without endless confusion. As interstate organizations of capital were confronted by interstate organizations of labor, it became increasingly evident that labor problems must receive national rather than merely local or state solution. Thus American democracy was becoming more and more nationalistic.

The transformation which modern science and its application to industry had brought about in the nation was also powerfully affecting the international position of the United States. Though independence had been achieved through a foreign alliance and largely because of certain conditions in European politics, the founders of the republic were soon convinced that the safety of their political experiment could best be secured by political isolation. In 1823 the danger of intervention in American affairs by the reactionary governments of Continental Europe produced the Monroe Doctrine, setting forth the republican ideals of America, disclaiming interference with monarchical Europe, but insisting that the European system should not be further extended to any part of the American hemisphere.

This tradition of isolation was still the orthodox American theory on the outbreak of the European War; but it was maintained with increasing difficulty and with some inconsistencies as the 20th century opened. Steam navigation, the ocean cable and wireless telegraphy increased the number of international problems for which the United States was forced to assume some responsibility. The Spanish War and the acquisition of island possessions in the Pacific brought new relations with the European powers which had similar interests there and in eastern Asia. We were presently taking a large part in international counsels for the protection of China. While still expressly reserving the principle of the Monroe Doctrine, the United States took an active part in The Hague Conferences and even in the fateful conference of Algeciras on African affairs. American intervention hastened the close of the Russo-Japanese War and American public opinion followed with deep interest and sympathy the proposals for a new world organization to establish the reign of law for nations as well as for individuals.

America and the World War.— So matters stood at the outbreak of the European War. The President's proclamations of neutrality were quite in accord with traditional policy. Even when the invasion of Belgium showed Germany's cynical disregard of international law, American interest and responsibility in the matter were apparently very remote. The assumption of such responsibility by the government would have been possible only if the nation as a whole had clearly understood the issues of the European conflict, thus creating a unified public opinion. This was obviously not the case in 1914. The strongest body of American opinion favored the cause of the Allies, but the pro-German element was aggressively and highly organized. The largest group of all, especially west of the Alleghanies, was composed of those who could hardly realize what was happening in Europe and thought chiefly of America's protection from the horrors of European warfare. Under these circumstances, many even of those who sympathized with the cause of the Allies were convinced for the time being that the government must remain neutral. There was also among the more idealistic elements a strong desire that America, by holding somewhat aloof, should leave itself free to exercise a mediatory influence in the interest of a lasting peace.

The abandonment of the neutrality policy came by a very gradual process, which is partly reflected in the speeches of President Wilson, especially during the year 1916. The development of the President's policy was undoubtedly much too slow for those who had felt from the beginning that France and England were guarding democracy and international justice against the militaristic traditions of the Central Empires. On the other hand, his gradual assumption of American responsibility in the international crisis was, up to the date of his war message of 2 April 1917, somewhat in advance of the great body of American opinion. He had, however, by that time so far won the confidence of this uncertain group, both as to his understanding of the international situation and the political ideals toward which he was working, that it was willing to accept his leadership.

The direct menace to the United States of German methods and German aims was brought home more and more by the recklessness of the submarine warfare; by the intrigues of German agents in the United States and the acts of violence instigated by them; by their persistent appeals to the separate consciousness of the German-born element; and lastly by their efforts to disturb the friendly relations of the United States with Latin-America. From a strictly nationalistic point of view, these things fully justified the President in asking and Congress in voting the declaration of war in April 1917.

There was, nevertheless, an important group which was not satisfied by any purely nationalistic conception of the issue. These men were patriotic, but American loyalty meant to them not only the defense of immediate national interests but allegiance to American ideals. In the Civil War Lincoln had summoned to the preservation of the Union not merely the sentiment of American patriotism but the devotion of those who valued America as the chief representative in the world of democratic ideals — of government by the people. On that ground also he asked the moral support of European liberals, especially the British working-classes. More and more the great European War seemed to involve equally momentous consequences for civil liberty. The victory of a highly organized military monarchy like Prussia over the democracies of western Europe was likely to discredit democracy as the less efficient form of government and thus exert a reactionary influence on political thinking everywhere. This issue was clarified when the Revolution of March 1917 overthrew the Russian autocracy and the conflict became more distinctly than before one of the free nations against the most aggressive exponents of the monarchical tradition. So President Wilson was able to reinforce the nationalistic appeal by raising the larger issue. As Monroe's message asserted the *interest* of the United States in the preservation of the Latin-American republics, so Wilson, dealing with a world far more closely knit together, made his plea, that the «world» should «be made safe for democracy.»

In his presentation of war aims, the President also appealed to the growing sentiment among thoughtful men everywhere, nowhere stronger than in the United States, for some escape from national egoism and international anarchy. Such men followed with sympathy the President's stubborn refusal to be drawn into an imperialistic policy toward Mexico; they defended his extraordinary patience in the face of German aggression; and they hoped to the last that the United States, without actually entering the war, might contribute something to the establishment of a just and lasting peace. The clearest expression of this idea that America must accept a more definite responsibility for the establishment of a new international order is to be found in the President's speech to the Senate of 22 Jan. 1917. The time had come, he said, «to lay afresh, and upon a new plan, the foundations of peace among the nations.» «It is inconceivable,» he continued, «that the people of the United States should play no part in that great enterprise. To take part in such service will be the opportunity for which they have sought to prepare themselves by the very principles and purposes of their policy and the approved practices of their government ever since they set up a new nation in the high and honorable hope that it might in all that it was and did show mankind the way to liberty.» It must be said, however, that this emphasis on the larger responsibility of the United States aroused the antagonism of certain senators who urged the danger of abandoning the traditional policy of isolation.

A few days later the German government by its announcement of practically unrestricted submarine warfare not only declared virtual war against the United States but proclaimed its entire lack of sympathy with the international ideals of which the American President had become the chief exponent.

Phases of Public Opinion.— When Congress, acting upon the recommendations of the President declared war on the German Empire, there was still opposition in Congress and in the country at large, an opposition more serious indeed than is indicated by the overwhelming majorities in both houses (72 to 6 in the Senate and 373 to 50 in the House). This is shown by a study of the Congressional debates and by reports from various sections in the press and elsewhere. In this as in many other cases it was inevitable that even a democracy should depend in some measure upon the guidance of its chosen representatives and especially of the executive. It is equally evident, however, that the decision once made soon received a more general and effective support from public opinion than any similar decision in the history of the country. There was not at any time after the outbreak of the war an opposition comparable in relative strength to that of the Tories in the War of Independence, of the Federalists in 1812 or the «Copperheads» in the Civil War. Those who supported the war did so on various grounds — some undoubtedly as a simple matter of acquiescence in a decision already made. A more definite analysis of opinion brings out certain other facts of interest.

The war and the nature of the ideals for which the United States was fighting were not a distinctly party issue. The pro-German element had some influence in both the leading parties before the war but became almost negligible after its outbreak. Much the same thing may be said of the pacifist element, which, sympathizing with Wilson's international peace program, had accepted his conclusion that the first step toward such a goal must be the military defeat of the Prussian oligarchy.

To the Socialists the war brought a more difficult problem. They had always emphasized the solidarity of the working class interests as more important than strictly nationalistic aims. Nevertheless, after the outbreak of the European War, the majority of the Socialists in Europe supported their respective governments. In the United States, however, the majority wing of the Socialist organization persisted in its opposition to the war as a measure conceived in the interest of the capitalistic classes. This majority, made up of various elements, included genuinely idealistic pacifists, advocates of revolutionary socialism who were ready to fish in troubled waters and a distinctly pro-German group, which was possibly the leading factor in determining the position of the party. On the other hand a considerable group of Socialist «intellectuals» dissented from the party decision and left the party. It is impossible to analyze accurately the Socialist vote in recent elections so as to determine the strength of pro-Germanism and pacifism as distinguished from economic discontent.

Before the outbreak of the war the sentiment in favor of American participation was most evident in the Northeastern States among the educated classes of that section who were most closely connected with the allied nations of Europe by various ties, economic, social, intellectual. This was in part, at least, the obvious effect of geographic proximity. On the other hand, the large cities of the East furnished considerable centres of pacifist and Socialist opposition, especially among their imperfectly Americanized immigrant population. In the Middle West the unification of public opinion on war issues was delayed by the presence of a strong German element, by a somewhat antiquated type of anti-British feeling and a certain lack of interest in international relations. The last consideration naturally operated with still greater force in the rural areas of the South and in the States of the Far West. When, however, the war had actually begun the hearty acceptance of it as a great national enterprise was nowhere more striking than in many of the areas where the opposition had at first seemed most serious.

The attitude of labor was seen from the first to be one of crucial importance. How far would it accept the Socialist view that this was a «Wall Street War» in which the working class had no real interest? Fortunately for the country, the leaders of organized labor as a whole accepted the President's definition of the conflict as a war for democracy and depended upon his influence to safeguard their interests. There was some opposition to the policy within the ranks of organized labor, but the policy of the leaders was in general carried out. With the extreme radical wing of the labor movement, represented conspicuously by the I. W. W., the situation was quite different. Recruited outside the ranks of union labor from comparatively ignorant unskilled workers, and to a large extent from recent immigrants, it was easy for the leaders to draw their followers into unpatriotic and anti-social forms of opposition. Probably this opposition would have been much less formidable if the employing class had laid more emphasis on constructive measures and less on mere repression.

In short, the war has revealed to an even greater extent than could have been expected the national unity of the American people. Most striking of all has been the loyalty of the great majority of the foreign-born population, including even those of German ancestry, not only to the national government, but to the ideals for which America stands among the nations.

National Ideals in the Conduct of the War.— The national temper was revealed not only in the decision which brought America into the war, but no less clearly in the measures adopted to secure its effective prosecution, especially when these measures involved a radical departure from normal American practice. It was seen from the outset that American participation in the war must involve co-operation with the allied governments, to an extent beyond precedent since the days of the American Revolution. To make such co-operation cordial and effective, it was necessary to use every possible means to remove antiquated prejudices and promote a better mutual understanding between the United States and its European associates. This new spirit of international co-operation was promoted by the exchange of special missions between the United States and the allied governments,— notably the French Mission of Marshal Joffre and M. Viviani and the British Mission headed by Mr. Balfour, the British Foreign Secretary. The first thought of many Americans was that the part of this country would be chiefly financial and naval. Such co-operation was indeed given at once and on a large scale. It soon became evident, however, that the raising of a great American army for service abroad was also an urgent necessity. How was such an army to be raised? Notwithstanding the previous national tradition in favor of the volunteer system, public opinion rapidly took shape in support of the selective draft as the most democratic method of enlisting the citizenship of the country for the national defense. No less important were the measures adopted to secure the necessary economic support for the armies in the field. Funds for the use of the United States and the Allies had to be secured through national loans, unprecedented in amount and requiring the co-operation of millions of people who had never before invested in government bonds. The success of the Liberty Loans was a striking example of what may be accomplished through the co-operation of volunteer service with governmental agencies. The effect on the national *morale* was no less important than the financial return. Never before had so large a number of citizens become conscious partners in a great national enterprise.

In earlier wars, notably in the Revolution, the War of 1812 and the Civil War, the government, fearing the effect of heavy taxes on public opinion, had depended too largely on loans and paper money, weakening the national credit and depreciating the currency. As to the precise proportion of war costs in the Great War, to be raised respectively by taxes and loans, there were sharp differences of opinion; but there can be no doubt in any case that the Americans of 1917–18 set a new national record of willingness to carry the necessary burden of war taxes.

The successful prosecution of the war required not only the financial co-operation of governments, but acceptance by the American people of a new responsibility for the food supply of the allied nations which the submarine warfare had brought dangerously low. To secure this result it was found necessary to organize through the Food Administration a governmental control of commerce in food products, as for instance by fixing the price of wheat, which went squarely against traditional American ideals. On the other hand, the government depended largely on appeals to the patriotism of producers, middlemen and consumers to stimulate production and lessen unnecessary consumption. The result was seen not only in an increase of food exports to the Allies, but again, as in the case of the Liberty Loans, in the awakening of a new sense of civic responsibility.

The spirit of civic co-operation was shown also in the support of various auxiliary agencies, such as the Red Cross, the Y. M. C. A., the Knights of Columbus and various other organizations, religious and philanthropic. All of these agencies required and secured for their operations voluntary gifts on a scale which before the war would have been thought improbable. It is in these various forms of voluntary co-operation even more than in any formal votes that the future historian will find the best evidence of national solidarity in support of the war aims of the United States.

No honest historian of national ideals can leave out of the record the darker shades of the picture. War unquestionably develops the spirit of self-sacrifice, but it also gives new opportunities to those who are willing to profit by the necessities of the nation. The problem of the profiteer is as old as war itself and is writ large in the record of earlier wars. In the present war this danger to the national *morale* was perhaps more clearly foreseen than ever before and appropriate safeguards were carefully considered; it was hardly reasonable to expect that it would be avoided altogether.

It soon became apparent that the necessities of war reconciled public opinion to extraordinary extensions of governmental authority. Step by step Congress authorized the taking over by the Federal government of various kinds of business — the railroads, the telegraph and telephone service, and to a large extent the shipping business. Through the War Industries Board and the Food and Fuel Administrations the government controlled to a large extent the production and distribution of products, directly or indirectly related to the efficient prosecution of the war. In the exercise of all these functions, the government did not escape sharp criticism, some just and some unjust; but public opinion accepted these radical changes with surprising composure. This comparative unanimity was partly due to the conviction that the measures in question were intended to meet a temporary emergency. None the less, they were in line with certain tendencies existing before the war began, and may have a permanent influence on the political philosophy of the American people. As in the period of the Civil War, the stress of a great national crisis had not only developed the authority of the national government as a whole; it had also immensely expanded the authority of the President as the chief agent of the national will. The people and their representatives in Congress had in large measure accepted his judgment on the main issues of international policy, and American confidence in this leadership was strengthened by the President's new position as the most generally approved spokesman of the Allied nations. In the carrying out of national policies also an extraordinary concentration of authority in the President was necessary in order to secure united and efficient action. Not only was he the commander-in-chief of the army and navy, but he directed through officials responsible to him the immense powers of the Food, Fuel, Railroad and Wire Administrations and the War Industries Board. To the statesmen of 1789 the concentration of such power in an American President would have been unthinkable; yet it is, in the main, only the application to new conditions of the war powers, whose latent possibilities were revealed in Lincoln's administration during the Civil War. Then as now they were accepted, not as desirable in themselves, but because concentration for executive purposes is in time of war one of the necessary measures by which the National Democracy is to achieve its ends. It must not be forgotten, however, that while the sentiment of nationality has been greatly strengthened, it is a nationalism increasingly conscious of international responsibilities, and ready to sacrifice not only material resources, but even those points of prestige which often prevent effective co-operation among allies. Striking examples of this spirit of international comity are the decision to allow American troops to be brigaded with those of the Allies, and the active part taken by the United States in securing the final acceptance of a unified military command. These were decisions of the President as commander-in-chief but they were cordially supported by public opinion.

Finally in the background of American thought during the war were the great problems of reconstruction, the growing recognition among thoughtful men of new problems, political, industrial, educational and ethical, which cannot be met by routine methods and purely emotional modes of thought — which demand on the contrary the effective use of all our intellectual and spiritual resources.

Bibliographical Note.— President Wilson's ‹State Papers and Addresses,› *Review of Reviews* (1918) also in various other forms; publications of the Committee on Public Information, the *Congressional Record,* especially January–May, 1917. Consult also Baker, ‹Frontier of Freedom›: Root, ‹The United States and The War›; Lodge, ‹War Addresses, 1915–17›; Spargo, ‹Americanism and Social Democracy.› Various aspects of public opinion may be followed in the *Nation, The New Republic, New York Times Current History, Literary Digest, The American Year Book.* See also Bullard, A., ‹Mobilizing America,› and, for suggestive discussions of American ideals on the eve of the European War the following: Eliot, ‹American Contributions to Civilization›; Roosevelt, ‹American Ideals›; Hart, ‹American Ideals›; Croly, ‹The Promise of American Life,› and his ‹Progressive Democracy›; Smith, ‹Spirit of the American Government›; Lodge, ‹The Democracy of the Constitution›; Mahan, ‹America's Interest in International Relation.›

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NATIONAL LEGISLATIVE ASSEMBLY. See CONSTITUENT ASSEMBLY.

NATIONAL LIBRARY (BIBLIOTHÈQUE NATIONALE) OF FRANCE, one of the world's most famous libraries. Some of its historians find its origin in the books of Charlemagne and Charles the Bald but this is doubtless mere legend. Saint Louis is said to have formed a collection in the 13th century, but whether his books are among those of the Bibliothèque Nationale is not known. At any rate, the real founder of the Royal Library was King John, who bequeathed his collection of manuscripts to his successor Charles V, who transferred it from the Palais de la Cité to the Louvre. The first librarian of record was Claude Mallet, the king's valet de chambre, who made a sort of catalogue ‹Inventoire des Livres du Roy nostre Seigneur estans au Chastel du Louvre.› Jean Blanchet made another list in 1380 and Jean de Bégue one in 1411 and another in 1424. Charles V was a patron of learning and encouraged the making and collection of books. It is known that he employed Nicholas Oresme, Raoul de Presle and others to transcribe ancient texts. This first collection of the King's Library was sold by Charles VI to the English regent of France, the Duke of Bedford, who transferred it to England in 1424. It was apparently dispersed at his death in 1435. Charles VII and Louis XI did little to repair the loss of these books, but the invention of printing resulted in the starting of another collection in the Louvre. Louis XI added to this characteristically by confiscating libraries that struck his fancy, as also did Charles VIII, who seized the collections of the kings of Aragon. Louis XII, who had inherited the library at Blois, incorporated the latter into the Bibliothèque du Roi and further enriched it with the splendid Gruthuyse collection and with plunder from Pavia. Francis I transferred the collection in 1534 to Fontainebleau and merged it with his private library. During his reign, fine bindings became the craze and many of the books added by him and Henry II are masterpieces of the binder's art. Under librarianship of Amyot, the collection was transferred to Paris during which process many treasures were lost. Henry IV again moved it to the Collège de Clermont and in 1604 it was housed in the Rue de la Harpe. The appointment of J. A. de Thou, the famous historian and bibliophile, initiated a period of development that made it the largest and richest collection of books in the world. He was succeeded by his son who was replaced, when executed for treason, by Jerome Bignon, the first of a line of distinguished librarians of the same name. Under de Thou, the library was enriched by the collections of Queen Catherine de Medici. The library grew rapidly during the reigns of Louis XIII and Louis XIV, due in great part to the interest of the Minister of Finance, Colbert, one of the most indefatigable collectors of books. The quarters in the Rue de la Harpe becoming inadequate, the library was again moved, in 1666, to a more spacious house in Rue Vivienne. The Minister Louvois took quite as much interest in the library as Colbert and during his administration a magnificent building to be erected in the Place Vendôme was planned. The death of Louvois, however, prevented the realization of this plan. Louvois employed Mabillon, Thevenot and others to procure books from every source. In 1688 a catalogue in eight volumes was compiled, and under the administration of Abbé Louvois, the Minister's son, the library was thrown open to all scholars. Abbé Louvois was succeeded by the Abbé Bignon, or Bignon II as he was termed, who instituted a complete reform of the library's system. Catalogues were made which appeared from 1739–53 in 11 volumes. The collections increased steadily by purchase and gift to the outbreak of the Revolution, at which time it was in grave danger of partial or total destruction, but owing to the activities of Renouard and Van Praet it suffered no injury. The Revolution appears to have benefited the library for many of the books of the emigrés and the suppressed religious institutions found their way to the shelves of the Bibliothèque Nationale, as it was now called. Furthermore an administrative organization was established that is the basis of its present system. Napoleon took great interest in the library and among other things issued an order that all books in provincial libraries not possessed by the Bibliothèque Nationale should be forwarded to it, subject to replacement by exchanges of equal value from the duplicate collections, making it possible, as Napoleon said, to find a copy of any book in France in the National Library. Napoleon furthermore increased the collections by spoil from his conquests, a good share of which, however, was restored after his downfall. During the period from 1800 to 1836, the library was virtually under the control of Joseph Van Praet, to the development of which he consecrated the whole of his energies. At his death it contained more than 650,000 printed books and some 80,000 manuscripts, many of them of exceeding rarity. His work has been carried on by Taschereau, Delisle and Marcel Homolle under whom the collections have grown to their present size of 4,050,000 volumes, 11,000 manuscripts.

NATIONAL MUSEUM. See United States National Museum.

NATIONAL NICKNAMES, the collective names of a people or nation. usually originating with the people themselves. John Bull was first given to the people of Great Britain by John Arbuthnot in his 'Law is a Bottomless Pit.' He also gave the names Nicholas Frog to the Dutch and Jean Crapaud (toad) to the French people. John Chinaman is a popular name for the Chinese; Taffy for the Welsh; Jean Baptiste and Canuck for the French Canadians, and Ivan Ivanivitch for the Russians; Paddy for the Irishman; Jacques Bonhomme for the French peasant; Sawney for the Scotch, and Blackamoor and Sambo for the negro in America.

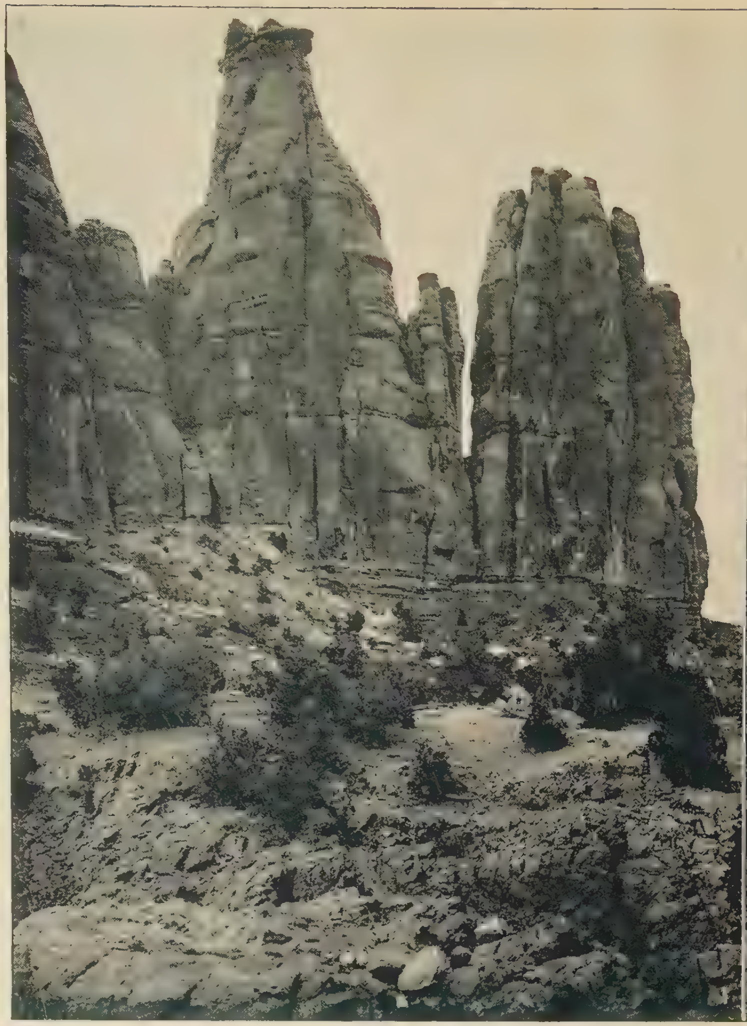
In the United States the two popular national names are Brother Jonathan and Uncle Sam. The former was first used. General Washington, on assuming command of the New England Revolutionary forces, was in great straits for arms and war material. The governor of Connecticut, Jonathan Trumbull, was a man of excellent judgment and an esteemed friend of Washington. In the emergency, Washington said, «We must consult Brother Jonathan.» This expression was repeated on other difficult occasions and became a convenient name for the whole people. The name Uncle Sam is an extension of the letters U. S. (United States), printed or stamped on the government property. It was first used in Troy, N. Y., in 1812, when certain goods purchased for the government and branded U. S. were officially inspected by Samuel Wilson, whose nickname was «Uncle Sam.» The coincidence of initials suggested the application of this nickname to the government. In the World War, the names given to the soldiers of the various countries were English, Tommies; American, Sammies; German, Boches or Fritz; French, Poilus.

NATIONAL PARKS AND MONUMENTS. The former are large tracts of public lands in the central and western parts of the United States retained, maintained and improved by the Federal government for such purposes as are mentioned in the National Parks Service Bill, creating in the Department of the Interior «a service to be called the National Park Service, which shall be under the charge of a director who shall be appointed by the Secretary.» That service «shall promote and regulate the use of the Federal areas known as national parks, monuments and reservations,» the object being «to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations.» National monuments, on the other hand, are defined in an act approved 8 June 1906, entitled «An act for the preservation of American antiquities» as historic landmarks, historic and prehistoric structures and other objects of historic or scientific interest that are situated upon lands owned or controlled by the government of the United States.

There are at present 16 national parks. The oldest, Hot Springs, was created in 1832; the most recently created, the Hawaiian and the Lassen, date from 1 Aug. 1916 and 9 Aug. 1916, respectively. The following list gives, beside the name of each, its location, date of creation, area in square miles and distinctive characteristics:

Hot Springs, 1832, middle Arkansas, 1½ square miles. There are 46 hot springs possessing curative properties; many hotels and boarding-houses; 20 bathhouses under public control.

Yellowstone, 1872, northwestern Wyoming, 3,348 square miles. A greater number of gey-



Photographs by George L. Beam, Denver, Colo.

1 "The Court Group," Colorado National Monument, near Grand Junction, on the Denver and Rio Grande Railroad. (An idea of the immense size may be obtained by noting the minute figure of a man near centre of picture, half-way between camera and rock)

2 "Independence Rock" (side view). Colorado National Monument, on the Denver and Rio Grande Railroad. Height from bottom of canon to top of rock, 800 feet

sers than in all the rest of the world; also boiling springs, mud volcanoes, petrified forests; grand canyon of the Yellowstone, remarkable for its coloring; large lakes, streams and waterfalls; wilderness inhabited by deer, elk, bison, moose, antelope, bear, mountain sheep, beaver, etc.— the greatest wild animal and bird preserve in the world; altitude, 6,000 to 11,000 feet.

Yosemite, 1890, middle-eastern California, 1,125 square miles. The valley is famous for its beauty; there are high cliffs, waterfalls, three groves of big trees, high sierra, large areas of snowy peaks, the «waterwheel» falls; and here, as in several other national parks, good trout fishing.

Sequoia, 1890. middle-eastern California, 237 square miles. The big tree national park, containing 12,000 sequoia trees over 10 feet in diameter; mountains and precipices.

General Grant, 1890. middle eastern California, 4 square miles. This was created to preserve the «General Grant tree,» 35 feet in diameter; it is six miles from Sequoia National Park and under the same management.

Casa Grande Ruin, 1892, Arizona, ¾ square mile, a prehistoric Indian building.

Mount Rainier, 1899, west-central Washington, 324 square miles. The largest accessible single-peak glacier system, containing 28 glaciers, some of large size, 50 to 500 feet thick; also sub-Alpine wild-flower fields.

Crater Lake, 1902, southwestern Oregon, 249 square miles; the lake, extraordinarily blue, lying in the crater of an extinct volcano. The sides are 1,000 feet high; the lava formations are interesting.

Wind Cave, 1903, South Dakota. 16½ square miles, a natural cavern with passages or galleries 90 miles in aggregate length.

Sully's Hill, 1904, North Dakota, 6¼ square miles, a wooded hilly tract on Devil's Lake.

Mesa Verde, 1906, southwestern Colorado, 77 square miles; most notable and best preserved prehistoric cliff dwellings in the United States.

Platt, 1906, southern Oklahoma, 1½ square miles; sulphur and other springs possessing curative properties.

Glacier, 1910, northwestern Montana, 1,534 square miles. This is a rugged mountain region of Alpine character. In it are found 250 glacier-fed lakes of romantic beauty; 60 small glaciers; peaks of unusual shapes and precipices of great height.

Rocky Mountain, 1915, north-middle Colorado, 358 square miles; embracing a snowy range with peaks from 11,000 to 14,500 feet in altitude in the heart of the Rockies. Here are seen remarkable records of the Glacial Period.

Hawaiian, Hawaiian Islands, 56 square miles; including three volcanoes and a lake of blazing lava.

Lassen, 1916, California, 106 square miles. This includes a volcano — the only one in the United States that is still potentially active.

Purposes Served by National Parks.— The Secretary of the Interior writes that there is no reason why the United States should not make its public health and scenic domain as available to all its citizens as Switzerland and Italy make theirs. The aim is to open the national parks thoroughly by road and trail «and give access and accommodation to every degree of income»; accordingly renewed efforts are promised, «to outfit the parks with new hotels which should make the visitor desire to linger rather than hasten on his journey.» The Secretary's comment on the Yellowstone Park concludes: «Its great size, its altitude, its vast wildernesses, its plentiful waters, its favorable conformation of rugged mountain and sheltered valley and the nearly perfect protection afforded by the policy and the scientific care of the government have made this park, since its inauguration in 1872, the natural and inevitable centre of game conservation for this nation. There is something of significance in this. It is the destiny of the national parks, if wisely controlled, to become the public laboratories of nature-study for the nation.» From them specimens may be distributed to the city and State preserves, as is now being done with the elk and may be done later with the antelope. The report of the general superintendent and landscape engineer of national parks for 1915 contains the observation that the first step in the consideration of a general policy for the administration of the national parks is the determination of just what functions they perform. The general superintendent expresses the opinion that «the fostering of recreation purely as such is more properly the function of the city, county and State parks.» We must note the clear distinction between the character of such local parks and those which are national. The latter form a class that should be of national interest; and in the category of national parks no reservation should be found that is of local interest only. The national parks should serve three functions: The stimulating of national enthusiasm or patriotism, the furthering of knowledge and health and the diverting of tourist travel to the scenic areas of the United States. The claims of the national parks upon the attention of tourists and others are thus summarized: «In Yellowstone are the geysers, in Yosemite the highest of waterfalls, in Sequoia the largest and oldest trees on earth, trees that were 3,000 years old when Christ was born. In Wind Cave National Park is a cave that comprises over 90 miles of sparkling passages. At Arkansas Hot Springs and Platt National Park are medicinal waters that have dispelled the pain of legions of sufferers. In Mesa Verde National Park are the crumbling dwellings of a forgotten race.»

The National Monuments.— There were 30 «national monuments» (as above defined) at the close of 1917, two which formerly existed having been eliminated by the creation of Lassen National Park. Their names, State and areas (in acres) are given in the following list: Devil's Tower, Wyoming, 1,152; Montezuma Castle, Arizona, 160; El Morro, New Mexico, 160; Chaco Canyon, New Mexico, 20,629; Muir Woods, California, 295; Pinnacles, California, 2,080; Tumacori, Arizona, 10; Mukuntuweap, Utah, 15,840; Shoshone Cavern, Wyoming, 210; Natural Bridges, Utah, 2,740; Gran Quivira, New Mexico, 160; Sitka, Alaska, 57; Rainbow Bridge, Utah, 160; Lewis and Clark Cavern, Montana, 160; Colorado, Colorado, 13,883; Petrified Forest, Arizona, 25,625; Navajo, Arizona, 360; Papago Saguaro, Arizona, 2,050; Dinosaur, Utah, 80; Sieur de Monts, Maine, 5,000; Gila Cliff Dwellings, New

Mexico, 160; Tonto, Arizona, 640; Grand Canyon, Arizona, 806,400; Jewel Caves, South Dakota, 1,280; Wheeler, Colorado, 300; Oregon Caves, Oregon, 480; Devil Postpile, California, 800; Mount Olympus, Washington, 299,370; Big Hole Battlefield, Montana, 5; Cabrillo, California, 1. Of these 30, the first 20 are administered by the Interior Department, the next eight by the Agricultural Department and the last two by the War Department.

An article entitled 'Our National Parks' in the *Scientific American,* 11 Nov. 1916, includes an observation on the commercial value of tourist traffic: «It is estimated that in time of peace Switzerland's annual revenue from tourists is $150,000,000, that of France $600,000,000. It is claimed that Americans have spent $500,000,000 a year in travel abroad. The pine woods of Maine are estimated to bring a revenue of $40,000,000 each year on account of the visitors they attract. Every dollar, therefore, which is spent by the nation on national parks may be considered an investment on capital account which is likely to bring in a very satisfactory return upon the money invested.» (See also separate articles Casa Grande Ruin; Crater Lake; General Grant; Hot Springs National Park; Yellowstone National Park, etc.). Consult Yard, R. S., 'The Book of the National Parks' (New York 1919).

NATIONAL PORTRAIT GALLERY, British, an institution that owes its origin to the zealous and enlightened efforts of Earl Stanhope. A board of trustees was appointed late in 1856, and by the end of the following year 23 portraits had been secured — some of them purchases and others gifts. The difficulty of the trustees is to guard against improper admissions in the way of donation, and therefore no donation can be accepted unless approved of by at least three-fourths of the trustees present at a meeting. At present the National Portrait Gallery contains over 2,000 portraits, under the varieties of paintings, busts, medallions, etc. Its treasures were for a time accommodated in the Bethnal Green Museum, but a new building, erected for it mainly by private munificence (funds being provided by W. H. Alexander), beside the National Gallery, was opened in 1896. The arrangement of the portrait is chronological, beginning with Richard II (1366–40). The large picture of the «Reform Parliament» hands in the lower exhibition hall, while the portraits exhibited include representative works of Van Dyck, Gainsborough, Reynolds, Raeburn, Lawrence, Watts and other great masters.

NATIONAL REPUBLICAN PARTY, in American history, the name taken by the Republican elements which under the leadership of John Quincy Adams and Henry Clay opposed the Presidential candidacy of Andrew Jackson in 1828. Clay, their candidate in 1832, was defeated and the party never again rallied.

NATIONAL ROADS. See Roads and Highways.

NATIONAL SOCIETY OF THE SONS AND DAUGHTERS OF THE PILGRIMS, The. Organized at Providence, R. I., Monday, 21 Dec. 1908, by 10 gentlemen, most of whom were of *Mayflower* ancestry. The plan and purposes of the Society originated with Thomas W. Bicknell of Rhode Island, who had, for a year, consulted with men and women of Pilgrim ancestry in several States as to the needs and work of such a society. The term «Pilgrim» was used in the broad sense to include all those who settled in any one of the American colonies, between 1607 and 1700. This period the English historian Green calls the «Pilgrim Century» in the great western trans-Atlantic settlement. During that century, many thousands of the yeoman class, with a sprinkling of nobility, crossed the ocean and made permanent homes on the eastern coast of America, between the Saint Lawrence and the Gulf of Mexico, and their descendants, numbering many millions, are located in all the States of the Union.

The objects of the Society are to perpetuate the memory and to foster and promote the principles and virtues of the Pilgrims; to publicly commemorate, at stated times, principal events in the history of the Pilgrims, and to erect durable memorials of historic men and events; to encourage the study and research of Pilgrim history, especially as related to the foundation of civil government on the principles of soul liberty; to foster and to establish such departments of study and of organization as shall seem best to promote social rights, civic virtue, industrial freedom, political equality, the supremacy of just laws, the value and sacredness of the ballot, the purity of the home, temperate and godly living, and the dependence of individuals, communities, states and nations on the guidance of Almighty God, as taught by the Pilgrims. Any person of good moral character, in lineal descent from Pilgrim ancestry in any colony prior to 1700, is eligible to membership. The officers are a governor-general, a deputy governor-general for each State, seven assistants, a secretary-general, a treasurer-general, a captain, an elder, an historian and a board of commissioners of seven members, of which the governor-general and the secretary-general are members, ex officiis. These officers constitute the General Court of the Society. They are elected annually in the month of December of each year, hold office for one year or until their successors are elected. The secretary-general, who is the executive of the General Court, is elected by that body.

Local chapters and State societies are formed under the direction of the secretary-general. The headquarters of the National Society are in Providence, R. I. Thomas W. Bicknell, the founder of the Society, is the secretary-general.

NATIONAL SOCIETY FOR VOCATIONAL EDUCATION, New York City, an association to aid in the evolution of sound aims, methods and practices and to promote the further development of practical vocational education for agricultural, commercial, homemaking and industrial occupations. It was the first national organization to promote interest in publicly supported vocational education, and until 1918 its title was the National Society for the Promotion of Industrial Education. Through its earlier conventions and publications it crystallized the public opinion that led to the enactment of legislation in the States which pioneered the development of public vocational schools. Its organization is democratic. Its membership includes industrial managers, educators, labor leaders, social workers, manufacturers and other public-spirited men and women. See Vocational Education.

NATIONAL SOLDIERS' HOMES. See Soldiers' Homes.

NATIONAL SONGS. See National Hymns.

NATIONAL OR STATE GUARD. See Militia.

NATIONAL TRANSCONTINENTAL RAILWAY (Canadian Government Railways). This railway is the eastern section, extending from Moncton to Winnipeg, of a railway spanning the continent, the western section of which, from Winnipeg to Prince Rupert, is called the Grand Trunk Pacific Railway. The entire system was the joint enterprise of the Canadian government and the Grand Trunk Railway. Owing to the inability of the Grand Trunk Pacific Company to operate the eastern section it was taken over by the government as part of the government railways in 1915. The great bridge across the Saint Lawrence River above Quebec, completed in 1917, is on this line. In the year ending 30 March 1917 receipts from passengers were $5,916,550; operating expenses $7,883,177; cost of line $152,802,746. The length of lines operated is 2,009 miles. For an account of the enterprise see Grand Trunk Pacific Railway.

NATIONAL UNION, an American fraternal and beneficial organization, incorporated in 1881 under the laws of Ohio. In 1917 there were 702 councils and 57,817 members in the order. Over $150,000,000 in insurance is carried by the members and $44,476,088 has been paid out in death benefits since its organization. The headquarters of the Order are located at Toledo, Ohio.

NATIONAL UNIVERSITY. History.— The proposition to establish a national university was first made by George Washington. He discussed such a university in his first Presidential message to Congress and from his private fortune bequeathed $25,000 to the nation as a basal sum around which a national university might be built. President Madison likewise urged upon the Congress the wisdom of establishing such an institution. Three of his Presidential messages deal with the matter. John Quincy Adams returned to the subject in a message to Congress, urging upon that body the consummation of Washington's plans. Congress was hostile to the plan. Jefferson opposed it. In 1811 a Congressional committee reported against a national university, pronouncing the scheme unconstitutional. Since then the proposal has been revived by several Presidents and by many statesmen but without favorable results, in spite of the George Washington endowment fund and a popular subscription fund of $30,000, which was paid in in 1795.

In 1869 the National Education Association espoused the cause of a national university by appointing a permanent committee of the association to promote the plan. Through this committee the subject was kept alive for more than 30 years. In 1899 a majority of the committee was composed of university presidents and rendered a report calling for Federal aid, but vigorously opposing Federal control of national education and declaring against a university maintained by the Federal government at the national capital. In 1907 the National Association of State Universities pronounced in favor of organized facilities for research in the scientific departments of the Federal government, but opposed a national university as a degree-conferring institution.

Educational and Research Facilities in Washington.— The various bureaus, departments, libraries, literary and scientific collections, museums, etc., maintained by the Federal government in Washington in themselves constitute valuable facilities for university research. They are equipment for university work. While these facilities are not organized in institutional form, they are open to investigators by resolutions passed by Congress in 1892 and again in 1901. The Act of 1901 provides:

> "That facilities for study and research in the government departments, the Library of Congress, the National Museum, the Zoological Park, the Bureau of Ethnology, the Fish Commission, the Botanic Gardens, and similar institutions hereafter established shall be afforded to scientific investigators and to duly qualified individual students and graduates of institutions of learning in the several states and territories, as well as in the District of Columbia, under such rules and restrictions as the heads of the departments and bureaus mentioned may prescribe."

The resources for study at the national capital are very great. The Library of Congress ranks high among the libraries of the world. The Smithsonian Institution has great value to the scientific student. In addition to departmental records and collections in various fields, there is the Corcoran Art Gallery, the Patent Office, the Geological Survey, the Medical Museum, the National Museum and various scientific bureaus, which together constitute an educational equipment far greater in value than that of any one organized educational institution anywhere in the world. Its value has been roughly estimated at $75,000,000. In a real sense this vast equipment is part of the equipment of every university in the United States in so far as such university makes use of it. In its best sense this is a national university where research is carried on under most favorable circumstances; its equipment is maintained by the national treasury; but the seal of approval for scientific achievement is granted in the form of degrees conferred by the universities located in the various States.

A. R. Brubacher.

NATIONAL WEALTH. See Wealth of Nations.

NATIONAL WOMAN'S CHRISTIAN TEMPERANCE UNION. See Woman's Christian Temperance Union.

NATIONAL WORKSHOPS. See Ateliers, Nationaux.

NATIONALISM, the Historical Development of.

I. Introductory Definitions.

No concepts in history, politics or sociology are to-day more important or evident, and, yet, at the same time, more difficult to define than the terms *nationality* and *nation*. To the writer it seems that a *nation* is a culturally homogeneous social group, which is at once conscious and tenacious of its unity of psychic life and expression. Some writers, especially Ernest Renan, have emphasized the «will» or desire to live together as the essence of a nation, but as more profound students, particularly the sociologists, have made clear, this will to live in, and to preserve the unity of, the group exists only where there is a very high degree of cultural and psychic likeness and unity. The most fundamental basis and characteristic of a nation, then, is cultural homogeneity, from which the will to exist in contiguity naturally proceeds. If such a group is at the same time politically organized within a given territory it may then be designated a *national state*. The term *nationality* is frequently used to describe a culturally homogeneous group which has not yet attained complete national and political unity, but it seems that this view only brings a confusion of terms. Rather, the term nationality should be used as a general descriptive and collective expression somewhat analogous to the broader meaning of the term politics in relation to a study of the state. It is a generic and comprehensive concept which refers to and describes that variable ensemble of physical and psychic elements which generate the cultural homogeneity and group self-consciousness and solidarity forming the foundations of a nation. The dynamic expression of the cultural and political activities and ambitions of a nation or national state is most usually and logically known as *nationalism*. While frequently used in the invidious sense, indicating political or cultural aggressiveness, such an implication is not essentially involved in the definition, even if it is normally to be observed in the practical operation of nationalism. In the static or analytical sense, nationalism is conventionally used to designate the modern political system or order, based as it is upon the unit of the national state. The history of nationalism then is essentially the tracing of the rise and development of the nation and the national state.

The history of the development of nations and national states is a most complicated problem. So difficult is it to determine just when tribal or pre-political society ends and political society begins and so many and deep-seated are the aspects of psychic life and cultural characteristics which are carried over from the tribal period into the political, that it is well-nigh impossible to say that one can fix any definite period as marking the origin of nations. One can scarcely agree with Israel Zangwill that the tribally organized Jews of ancient Palestine constituted a national state in the sense in which that term would be used to describe the Germany of Bismarck and Treitschke and Reventlow, or the Italy of Crispi and Carducci and Sonnino, and, yet, it is not easy to deny the force of his criticism of those writers who find nations to be wholly a phenomenon of very recent origin. Rather, it is best to agree that modern nations have their constituent psychic elements deeply rooted in the tribal past and that the history of nationalism and of nation-building is essentially the tracing of the expansion of cultural entities and of the sociological centres of emotional fixation; in other words, the record of the expansion and rationalization of «herd-instinct.» As human society has undergone tremendous transformations in the period from the gradual breakdown of tribal society to the 20th century, there are differences of corresponding scope and significance between the nature and the mode of expression of group psychology and culture in tribal society and in the national states of to-day. The most profound and far-reaching of these contrasts are connected with the conversion of the basis of group solidarity, from the standpoint of social control, from blood-kinship, real or assumed, to a definite territorial habitat, and with the development of what is conventionally known as «political society.» The distinctions will appear clearly only upon the careful historical analysis of the development of the constituent principles of the nations of to-day. It is this fact that renders such a survey of vital importance, entirely aside from the specific content of the historical facts enumerated.

II. A Brief Historical Sketch of the Stages in the Origins of Nationality and Nations Previous to the Rise of the Modern National States.

1. Tribal Society.— It is now generally agreed among students of cultural anthropology that the earliest well-defined units of social organization were either the village and local group, or the clan, both of which were normally grouped with others of the same type in a larger and looser entity — the tribe. While much of the psychology of tribal relationships and activities has been carried over into modern society, the contrasts between tribal society and the modern national state are many and obvious. Tribal society was primarily based upon blood-kinship, either real or assumed, and tribal relations were personal rather than political. Force, custom and blood-feud were the foundation of tribal juristic concepts and methods. The «instinct of the herd» had a much fuller sway over the group than it has at the present day. Cultural solidarity was more intense and there was little personal individuation, except that which set off a few leaders from the mass of the group. An intense religious loyalty and attachment to all the symbols of group unity were ever present and evident. So great was the domination of the group over the individual that some eminent students, such as Durkheim and his school, have even gone so far as to claim that all of the categories of religion, thought and knowledge in the primitive group were derived from the expressions of, and reactions to, group life and activities. Indeed, Durkheim finds that the essence and foundation of religion is but the psychic exuberance or stimulation from group life and activities and Trotter holds the «instinct of the herd» to be the primordial and all-pervading psychic force controlling man from the origin of the race to the present day. Whatever may be the exaggerations of these writers in matters of detail, it is generally agreed that the struggle for the preservation and extension of group solidarity has been the basic factor and process in the evolution of mankind, and it was inevitable that the psychic traits developed in this process would become grounded deep in the mental life of humanity. The tremendous importance of this discipline in group life for the subsequent development of humanity has been admirably summarized by Professor Hankins: «Man is in fact fundamentally social by nature. He has never lived in isolation but always in groups. Lacking special organs of defense he found strength, as did the ants and the bees, in group solidarity. Consequently the struggle for existence on the human plane has been fundamentally a struggle of group with group. Since his survival turned largely on the perfection of his gregarious instinct, there has been achieved in man a keen sensitiveness to the call of the group. This herd instinct, as Trotter calls it, is, therefore, the very basis of human society and the most profound aspect of man's social nature. It is for the group what the instinct of self-preservation is for the individual. It is aroused only in times of stress and danger; group fear in some form is essential to its development; when awakened it not only grips every tribesman in an atmosphere of electrified suggestibility, but stirs within his bodily mechanism the internal secretory apparatus whose products are essential to deeds of valor. It is in its strength and vigor an assertion of the group will to live, and is therefore as deep and mysterious and indeed as permanent as the eternal nisus of nature, the insistent push of everything that throbs with life and energy.» Further, tribal groups were relatively small, as compared to modern political aggregates, and were little attached to any particular territory. While such groups often held with great tenacity to particular areas on account of special economic advantages, such as better fishing or hunting grounds, it was the economic phases of the attachment rather than the purely territorial which played the predominating part. There was little hesitancy in leaving a particular locality to follow migrations of game or fish. This matter has been well summed up by Professor Robinson: «Patriotism, the love of one's *terra patria,* or natal land, is a recent thing. During far the greater part of his existence man has wandered over the earth's face as a hunter and can hardly have had any sweet and permanent associations with the tree or rock under which he was born. But the forerunners of territorial emotion were the group loyalties of the tribe, clan, family and totemistic group, in whatever order and with whatever peculiarities these may have originated and come to exist side by side.»

2. Early City-States.— The transition from tribal groupings and modes of life to the city-state, the earliest type of political organization, was gradual and slow. The chief contrast between tribal society and that of the proto-historic city-states was that in the latter the basis of group and individual relations was gradually coming to be political and territorial, rather than purely personal and consanguineous. For many and diverse reasons, groups tended to consolidate about certain vantage points determined by considerations of fortification and protection, religious significance, economic superiority and better potentialities for robbery and brigandage. Stability replaced the earlier nomadic life, and the habitat became more or less permanent. The early city-states did not, however, at all resemble the modern urban centres of life and industry. Life was still primarily agricultural, and the «city» was little more than a citadel surrounded by the homes of the peasants who would retire within the walls in time of danger. As trade developed and the division of labor between city and country was established, the early city-states assumed more of a commercial character and the coming of foreign merchants produced those problems of assimilation and the extension of citizenship which were the chief force in breaking down the remaining vestiges of tribal society and in creating the origins of the modern political order. A few historical or semi-historical instances of this specific and all-important change from tribal to civil society have been preserved in historical records. Such were the occupation and retention of ancient Palestine by the Jews and their subsequent choice of a king; the constitutional reforms of Cleisthenes in Attica at the close of the 6th century B.C.; the alleged reforms of Servius Tullius in early Rome and the subsequent constitutional struggle between the patricians and plebeians; and the breakdown of Teutonic tribal society and the establishment of political relations in the interval between Arminius and Alaric — the transition which Paul Vinogradoff has called «one of the most momentous turning-points in the history of the race.» Important as were the city-states of antiquity as a stage in political and social evolution, they were soon submerged in the great patriarchal empires which arose in the «state-making age» through the superior force and aggressiveness of one of these cities which compelled the submission and enforced the subjection of others. The ancient Egyptian Empire was a product of the forcible subjugation of the numerous city-states of the Nile Valley; the Babylonian, Assyrian and Persian empires were built up out of the progressive amalgamation of the city-states of the valleys of the Tigris and Euphrates and the coast of Asia Minor. Only the cities of ancient Hellas retained their independence long enough during the historical period to give any adequate conception of the type of cultural solidarity and political reactions which characterized the antique city-state. Here personal and kinship relations had been replaced by the institution of citizenship, based upon residence and naturalization instead of blood-relationship or elaborate initiation ceremonies designed to confer the sanction of artificial relationship. Groups were generally more populous and civilization more advanced than in tribal society. Most of the psychic characteristics of tribal life, however, were, if in a modified degree, present in the civilization of Athens, which may be taken as the most advanced product of the ancient city-state civilization. Group solidarity was still intense. The elements of common culture were prized even to the extent of being vested with a sacred significance. Ceremonies, costumes, legal and political forms and practices, moral codes, religious festivities, and even amusements were tinged with the divinity of their alleged origin. The gods were limited to the group and were regarded as wholly solicitous for the welfare of the particular political and social entity. The attitude toward foreigners was well exemplified by the well-known contrast between «Greek and Barbarian,» in which Aristotle was able to find a justification for the subjection of inferior peoples to the Greek «genius» for governing. The group leaders passed after their death into the realm of the gods or supermen and their magnified and exaggerated prowess became a most highly prized group possession. In addition to these phases of group solidarity and symbolic unity, which had their roots in tribal psychic life, a new attachment to territorial possessions arose when fixity of habitat had become the rule. Not only were particular sacred places, such as

Olympus and Delphi, prized and venerated, but the whole habitat of the group was valued as a special gift from the gods. Aristotle found that the fortunate situation of the Greeks in their geographical habitat served sufficiently to explain the «superiority» of Greek genius. The ancient city-states seemed well on the way toward transforming group life from the tribal to the modern national basis and had made notable advances in that direction. Had their progress not been arrested by the development of the great patriarchal empires, mentioned above, the national state in its completeness might have been a product of antiquity. For better or worse, however, this was not to be, and even Athens itself was swallowed up in the imperial domains of the Macedonian conqueror after its African and Asiatic prototypes had long before bowed to the might of Thebes, Memphis, Babylon, Nineveh, Ecbatana, Sardis and Susa. James Bryce has admirably described the general absence of anything approaching a national cultural or political union before the conquests of Rome: «Men with little knowledge of each other, with no experience of wide political union, held differences of race to be natural and irremovable barriers. Similarly, religion appeared to them a matter purely local; and as there were gods of the hills and gods of the valleys, of the land and of the sea, so each tribe rejoiced in its peculiar deities, looking on the natives of other countries who worshipped other gods as Gentiles, natural foes, unclean beings. Such feelings, if keenest in the East, frequently show themselves in the early records of Greece and Italy; in Homer the hero who wanders over the unfruitful sea glories in sacking the cities of the stranger; the primitive Latins have the same word for a foreigner and an enemy; the exclusive systems of Egypt, Hindostan, China are only the more vehement expressions of the belief which made Athenian philosophers look upon a state of war between Greeks and barbarians as natural, and defend slavery on the same ground of the original diversity of the races that rule and the races that serve.»

3. **The Patriarchal Empires of Antiquity.** — The formation of the extensive and autocratic patriarchal empires in what Bagehot has somewhat loosely called «the nation-making age» was one of the most important and sweeping transformations in the political and social evolution of humanity. Paradoxical as it may seem, they both stifled and promoted the growth of nations and nationalism. Their development was invariably brought about by the cumulative extension of the power and prestige of some more powerful and aggressive city-state at the expense of its neighbors. This very process naturally produced an enormous inflation of group pride and egotism on the part of the conquering city. Also, while subject cities were severely treated and their national culture sternly repressed, nothing makes a group so proud and tenacious of its cultural characteristics and possessions as persecution, and the conquerors unwittingly only intensified the particularism and local pride of such subject communities as maintained and preserved their corporate existence. The history of the ancient empires is little more than a record of constant warfare produced by the attempt of the ruling city and dynasty to repel and suppress the revolts of subject cultural groups. This process of ancient empire-building culminated in the expansion of imperial Rome, in its task of absorbing most of the then-known world and of bringing into existence the ideal «reign of universal peace» and uniform law. It is probable that the process of Roman expansion marked the nearest approximation to the spirit and methods of aggressive nationalism that was witnessed before the dynastic wars surrounding and accompanying the development of the modern national states. The crude and almost tribal expression of collective egotism in «international» policy; the public theory that all her wars were «defensive» and that Rome was always threatened by aggressive states; the alleged conviction that the gods were always favorable to these defensive wars; the control of diplomatic and military policy by the landed «Junker» aristocracy — the Senate: the ambition for private or family glory in war, as manifested by Claudius in the first Punic War and by Flaminius in the second Macedonian War; the «surplus population» argument for expansion; the «scrap of paper» attitude toward treaties as evidenced in the second Samnite War; the harsh and brutal treatment of conquered populations, extending to the devastation of fields, the burning of cities and the enslaving of populations; the insatiable greed for further expansion; the disregard of the «rights of small nationalities»— all of these aspects of Roman expansion, which are so familiar to students, sound exceedingly modern and seem quite capable, with some few changes of names, of furnishing the proper categories for the analysis of the development of the German Empire from the acquisition of Brandenburg in 1415 to the present momentous collapse of 1918. While this process of the formation of empires was most influential in creating the tradition of the glory of territorial expansion which was to serve as an important impulse to the aggressiveness of the modern national and territorial state, it should not be forgotten that there was a most radical difference between the political and cultural basis of such a political entity as the Roman Empire and the German Empire of the present day. Though there was a uniform and universal political system, there was no cultural homogeneity or common sentiment of loyalty, which are the indispensable foundations of the national state. Only the citizens of Italian Rome felt any emotional thrills of patriotic reaction at the triumphal processions of the conquering emperors or generals and at the recitation of the Virgilian epic of the growth of the *Pax Romana*. Though the subject peoples might formally acquiesce in the apotheosis of the Roman emperor and render a lip reverence and allegiance they preserved openly or secretly their admiration for their own heroes and leaders and retained their deeper loyalty and allegiance to their own pantheon. A common spontaneous patriotism and a general loyalty to the sovereign imperial state was quite unknown in the ancient empires, and the cultural homogeneity which must precede the political expression of national life was as remote from realization. Even the prevailing political philosophy-Stoicism — decried the sentiment of nationalism and patriotism, and lauded the notion of the

brotherhood of man and the cosmopolitanism of world-citizenship. Mr. Bryce thus depicts the nature and operation of the Roman imperial system, so different from the modern political order based on the national state: «No quarrels of race or religion disturbed that calm, for all national distinctions were becoming merged in the idea of a common Empire. The gradual extension of Roman citizenship through the *coloniæ*, the working of the equalized and equalizing Roman law, the even pressure of the government on all subjects, the movement of population caused by commerce and the slave traffic, were steadily assimilating the various peoples. . . . From Rome came the laws and language that had overspread the world; at her feet the nations laid the offerings of their labor: she was the head of the Empire and of civilization, and in riches, fame and splendor far outshone, as well the cities of that time as the fabled glories of Babylon or Persepolis.» Had Rome continued to exist with an improved method of imperial administration and economics for 2,000 years after her «fall,» it might have been possible for her to have welded her diverse subject populations into a single loyal and unified national unit, but the experiment was not allowed. In 378 A.D., the Teutonic barbarians from the North, who had been gradually filtering into the empire for three centuries, broke their leashes and started on their migrations, which submerged the ancient world in the return of pre-classical barbarism and produced a Clovis, a Charlemagne and an Otto the Great to repeat the tasks of an Agamemnon, an Alexander and an Augustus. The ancient world, then, passed without producing the complete parallel of the modern national state, but it laid the psychological and political basis upon which it could develop, though it must not be forgotten that the growth of the modern national state has been to a large degree a progress *sui generis,* primarily independent of ancient impulses, even if influenced by ancient models. The psychological contributions of Rome to modern nationalism and the continuity of Roman egotism and jingoism with modern militarism and patriotism have been eloquently stated by Professor Muzzey in the following citation: «The Roman spirit was bequeathed to Europe. Beneath all the art and letters, all the industry and commerce, all the advance in humanity throughout European history, that Roman idea remains. When the old nations speak of patriotism they mean the memory of their glorious wars. War has been their constant occupation and preoccupation. Not a generation that has passed since Virgil, but has paid its terrible toll on the field of carnage to the ideal of pacifying the world by arms. It is not alone Germany, with the celebration of its men of blood and iron from Otto the Great to Otto von Bismarck. The French too, rejoice in the Napoleonic legend. They have their glorious wars of the *Grand Monarque.* They bow before the white plume of Henry of Navarre, and thrill to the echo of Roland's horn at Roncesvalles. The English have their proud memories of Agincourt and Blenheim and Crecy and Waterloo and celebrate their Napiers and Nelsons and little «Bobs.» All these nations of old Europe have their glorious traditions of war, and each one can find enough victories in the uninterrupted course of slaughter through the Christian Ages to justify its belief in its own invincible prowess — nay, even in its divine mission to rule the rest. The Roman ideal still lives in them all. Great Cæsar's ghost still walks as at Philippi. He stalks, gaunt and terrifying, before the chancelleries at London and Berlin, at Vienna, Paris and Rome.»

4. The Middle Ages.— The political, social, economic and cultural conditions of the «Middle Ages» were no better adapted to the production of the national state than was imperial antiquity. The unit of political organization and administration was the domain of the feudal lord, which varied greatly in extent, but never in any way approximated identity with any cultural or national entity. Usually the domain was but a small isolated element in the feudal hierarchy, and it made for political decentralization and local immunity rather than for national unity. The centre of social life was the infinite number of isolated and minute mediæval manors and the many small and scattered mediæval towns. The units of agrarian and urban industry, the manors and the towns, respectively, were isolated, self-sufficient and narrowly selfish and provincial, and were wholly unadapted to providing any firm economic foundations for national unity. The pivotal points in mediæval cultural activity were the towns, but they were too few, too poorly connected with others by the way of communication and too much governed by the spirit of localism and jealous isolation to be able to bring into being any degree of that general cultural homogeneity, so all-essential to the existence of any degree of national unity.

Not only were these local units of the mediæval period ill-adapted to the creation of nations and national states, but there operated from the other extreme powerful forces and institutions making for a continuance of that universalism which had characterized the Roman Empire. Indeed, it has usually been held that universalism and cosmopolitanism were the dominant ideals of the «Middle Ages» — a sentiment best summed up in Dante's 'De Monarchia,' with its vision of a church and empire universal. Set off against the actual political diversity and localism of the feudal system was the political symbol of unity and cosmopolitanism — the Holy Roman Empire. Whatever its actual weaknesses, its symbolic power over the mind of Europeans was sufficient to cause so ardent a nationalist and so blasé an advocate of *Realpolitik* as Frederick the Great to bow before it, even in the days of its declining strength. A universal moral and religious control over mediæval life was provided by the Roman Catholic Church, whose growth has been described by an eminent authority as «the rise of the new Rome.» With its control over the religious, and to a large extent the mental, life of the mediæval period through its elaborate hierarchies for administration and for the control of the sacraments, the mediæval church, with the aid of the inquisition against heresy, brought about a degree of psychic unity throughout Europe never before equalled. Under its greatest popes, such as Innocent III, the Church also exercised a degree of control over European politics never matched by any emperor of the period. The three leading crowned heads of Europe were in turn disciplined by Innocent. The learning of Europe was no less markedly universal. The Church prescribed a single theology for all western Europe, which was embodied in the 'Book of Sentences' of Peter Lombard and the 'Summa Theologica' of Thomas Aquinas. As theology was regarded throughout the mediæval period as the «queen of the sciences,» and education was chiefly in the hands of the churchmen, the realm of learning was no less unified than that of the spiritual world. Again, there was a striking unity of language and literature during the period. While the vernacular languages and literatures began to appear in the 11th and 12th centuries, Latin was, during the greater part of the Mediæval Age, the language of politics, business and learning throughout western Europe. The literature read by the vast majority of those who were able to read was not less uniform than the language; the Bible, the works of the leading «Fathers,» the few theological manuals extracted from them, and the crude Latin encyclopedic compilations by Isidore and Rhabanus Maurus and their like, were almost the only books read until the prose and verse of the vernacular languages began to appear at the height of the mediæval period. Mr. Bryce in the following brilliant passage characterizes the remarkable unity which was at least symbolically brought to the mediæval period by the church and empire universal: «It is on the religious life that nations repose. Because divinity was divided, humanity had been divided likewise; the doctrine of the unity of God now enforced the unity of man, who had been created in his image. The first lesson of Christianity was love, a love that was to join in one body those whom suspicion and prejudice and pride of race had hitherto kept apart. There was thus formed by the new religion a community of the faithful, a Holy Empire, designed to gather all men into its bosom, and standing opposed to the manifold polytheisms of the older world, exactly as the universal sway of the Cæsars was contrasted with the innumerable kingdoms and republics that had gone before it. The analogy of the two made them appear parts of one great world-movement toward unity; the coincidence of their boundaries, which had begun before Constantine, lasted long enough for him to associate them indissolubly together, and make the names of Roman and Christian convertible. Ecumenical councils, where the whole spiritual body gathered itself from every part of the temporal realm under the presidency of the temporal head, presented the most visible and impressive examples of their connection. The language of civil government was, throughout the West, that of the sacred writings and of worship; the greatest mind of his generation consoled the faithful for the fall of their earthly commonwealth, Rome, by describing to them its successor and representative, the 'City which hath foundations, whose builder and maker is God.' »

In spite of this unique prevalence of the universal and the uniform in fact and symbol during the mediæval period, however, forces were working beneath the surface that were to rend asunder this artificial unity for centuries. As early as the Strassburg Oaths of 842 there could be detected the first beginnings in the differentiation of those vernacular languages which were to lay the literary basis for national diversity and rivalry. Moreover, it should not be forgotten that in a curiously indirect and obscure, but nevertheless real, manner the mediæval period furnished a psychological impulse to the growth of nationalism by its influence on the «Romanticists» many centuries later. It was in part from an imperfect understanding of the Mediæval Age that this school obtained its sentimental impulse, which operated powerfully in the creation of the new nationalism during the French Revolution, and its notion of the unique and indigenous nature of national character, which formed the basis of much of 19th century nationalistic philosophy and historical literature. The revival of Roman law in western Europe in the 12th and following centuries became a powerful instrument making for royal supremacy and the rise of the dynastic state. The new commerce with the East, which had been built up by the Italian cities in the period of the Crusades, was to produce the Italian city-states, which first successfully defied the principle of imperial unity and were the harbingers of the repetition of that process on a vastly greater scale in northern Europe, when the opening of the new trade routes with the East and West should usher in the «Commercial Revolution» and with it the dawn of the Modern Age.

III. The Commercial Revolution and the Rise and Development of the Modern Dynastic National States.— In October 1492 Columbus landed on San Salvador in the Bahamas and in May six years later Vasco de Gama reached Calicut on the coast of India, and the two most significant steps had been taken in bringing about that great revolution in commerce, thought and politics, which, in the totality of its dynamic reactions on European civilizaztion, was to produce the modern world and to initiate that process of national development, differentiation and rivalry which has since persisted without abatement and is not likely to be suspended until a supernational organization shall have been erected with power to curb aggressive nationalism and vested with a function for mutual service which will attract the loyalty of the several component parts of the general world organization.

The older generation of historians, under the spell of the exaggerations and incomplete knowledge of Burckhardt and Symonds, were wont to regard the origin of the modern state system as the product of the so-called «Renaissance,» or, guided by the enthusiasm of Ranke and Schaff for the Lutheran revolt, conventionally dated the emergence of nationality from the Protestant revolt and its resulting political adjustments in the Peace of Augsburg and the Treaty of Westphalia. A more profound study of modern history by such writers as Brandi, Cunningham, Shepherd, Cheyney, Robinson, Abbott, Beard and Bolton has revealed the fact that both «Renaissance» and «Reformation,» in their broadest aspects, were but phases or results of that great transformation which marks the origin of the modern world and the national-state system — the «Commercial Revolution.» By this is meant not only the discoveries, the revival of trade and the «intervention of capital,» but also the reactions of these innovations upon the whole basis of European civilization. The permanent intellectual progress which followed the so-called «revival» of the 15th century was not so much the result of the resurrection of an antique culture as it was the product of the new psychic reactions which came from the contact of cultures and the intellectual curiosity stimulated by the discoveries. The modern intellectual world grew out of the work of Galileo, Kepler, Newton, Boyle and Lavoisier, and not out of that of Petrarch, Bruni, Poggio and Boccaccio. Not less disruptive of older doctrines has been the result of more critical research upon the deeper significance of the «Reformation.» After three centuries of befogging the real issues at stake under the mask of theological controversy, scholars have at last come generally to accept the doctrines of Sleidan, the greatest of contemporary authorities, that the Protestant revolt was primarily the result of the political and nationalistic ambitions of the North German princes, who found Luther's theological rebellion a timely «moral and religious issue» under which to hide their secular ambition to secure political independence from the Holy Roman Empire. The successful impulse to the religious wars that won the day for Protestantism came not from the zeal of the German princes for the triumph of «justification by faith,» but from their eagerness to attain unto the «cuius regio eius religio» clause of the Peace of Augsburg (1555) and the recognition of their full political sovereignty by the Treaty of Westphalia (1648).

The chief impulse that the Commercial Revolution brought to the growth of national states came from the rise of the middle class and their alliance with the monarchs in the attempt to destroy the anarchy and decentralization of the feudal system. Hitherto the kings had been compelled to depend upon the feudal lords for the administration of law, the provisions of royal funds and the military protection of the realm. It can scarcely be supposed that the feudal lords would render effective aid to any policy designed to limit their powers or terminate the political order to which they owed their existence. There was, therefore, no possibility of bringing about that all-essential step in political progress, the destruction of mediæval feudalism, until a new class had arisen with sufficient strength to furnish the kings with the loyal aid necessary to cope with the recalcitrant upholders of the old order, and until a source of royal income had been provided which would enable the kings to hire loyal officials and armies without relying for their financial support upon feudal taxes. Both of these all-important prerequisites for the growth of administrative centralization political concentration and the rise of the dynastic national state were supplied by the Commercial Revolution. A loyal officialdom, opposed to the feudal aristocracy, appeared in the new «Noblesse de la robe»— the middle class merchants and lawyers that filled the royal offices, and, through the «intervention of capital» coming into the royal treasuries from the national share in the profits of the new commercial and industrial enterprises, the kings were provided with the all-essential financial power to hire their own officialdom and to support a national army independent of the feudal lords. Then began that relentless war of the national monarchs against their old feudal rivals which extended from the accession of Henry VII of England in 1485 to the close of the last century. While this process involved a great development of royal absolutism and tyranny, as an inevitable accompaniment of the growth of national and dynastic centralization, the movement as a whole was one of the most important in the history of the political development of humanity. All the horrors of the domestic tyranny and foreign wars which have accompanied the rise of national states since 1500 have been the price which mankind has paid through the wasteful economy of nature in attaining to that stage of national independence and self-government which had to precede the ultimate goal of internal democracy and international concert, alliance or federation. Expensive as the process has been, students of the history of civilization unanimously recognize that the evolution of the national state and of large political aggregates had to be brought about before the basis could be provided for an intelligent, amicable, just and practicable arrangement between the states of the world. An international order arising directly out of the feudal system is inconceivable.

The emergence of the national dynastic state in modern times was first manifested in the case of England, due to the appearance in 1485 of a shrewd and vigorous monarch in the person of Henry VII, and to the fact that in England alone had the feudal nobility been gracious and self-effacing enough to prepare their destruction by a war of self-extermination — the War of the Roses (1455–85). Henry VII filled the royal coffers by taxing the feudal nobles through the use of «Morton's Fork» and other ingenious devices, haled recalcitrant and rebellious feudal lords before the Court of the Star Chamber, and encouraged the new commerce by treaties such as the «Intercursus Magnus» and by subsidizing such explorers as the Cabots. His son, Henry VIII, broke with Rome and gave a religious basis to the growing English nationalism. Elizabeth profited by the labors of her father and grandfather, and her reign witnessed the first great cultural expressions of English nationalism, as well as the emergence of England as a leading naval and colonizing nation. By the close of the Tudor period (1603) England had become a highly centralized dynastic national state. Feudalism in its political aspects had passed, and the middle class had so developed its political strength that a half-century later it was able to demonstrate its superiority over the Crown. After brief but brilliant development of Portuguese nationalism (1498–1580), Spain was next in the order of national development. Charles V had been an imperialist rather than a nationalist and had hoped to revive the Mediæval Empire, but his son and heir in Spain, Philip II (1555–98), was a true Spanish nationalist and proceeded to attempt to bring unity not only to Spain but to the Spanish possessions in the Netherlands. His over-ardent nationalism, however, brought disruption rather than centralization, and in 1567 the Dutch, led by William the Silent, broke into active revolt. The new Dutch national state declared its independence in 1581 and secured the European confirmation of its action at Westphalia in 1648. A century after England had emerged from civil war with a strong national monarch at the head of the state, Henry IV, the founder of the French Bourbon dynasty, came forth victorious over his opponents in the civil wars and was crowned king in 1589. Capturing not only Paris but France by a "mass," he began with his great minister, Sully, the building of the dynastic national state in France. His work was cut short by his untimely death at the hand of the assassin, Ravaillac, but his work and plan was carried on with vigor and determination by the great ecclesiastics and statesmen, Richelieu and Mazarin, until, by the time of the suppression of the Fronde in 1651, the feudal system as a dominating political power in France had passed away. The fruit of the work of Henry, Sully, Richelieu and Mazarin was appropriated by Louis XIV, in whose reign France reached not only the height of her dynastic centralization, but attained to the cultural primacy of Europe. The Thirty Years' War (1618–48) brought with it a multitude of nationalistic movements and demonstrated the fundamental political nature of the Protestant revolt. The stirrings of national ambitions in Bohemia (1618–20) and in Denmark (1625–29) were speedily repressed, but Sweden forged to the front as a great national state (1630–32) and maintained her position until it was lost through the insane ambitions of her warrior king, Charles XII (1697–1718). The Treaty of Westphalia first gave general European recognition to the growing national state system and to the existence of independent national sovereignty. It brought diversity rather than unity, however, to Germany and necessitated the postponement of German unification until the latter part of the 19th century, when this anachronistic and belated process was to disturb the peace of the world. But if a unified national German state was not the product of this general period of the development of dynastic national states, there appeared the dynasty and the state which were ultimately to bring centralization and unity to Germany-Prussia under the Hohenzollerns. After having developed from robber barons into wealthy city magnates of Nuremberg in southern Germany, the Hohenzollerns appeared upon the north European stage through the purchase of the mark of Brandenburg by Frederick Hohenzollern from the bankrupt Emperor Sigismund in 1415. Through fortunate marriage arrangements they secured the possession of Prussia in 1618. The basis of the Prussian bureaucracy and military system was laid by Frederick William the Great Elector (1640–88) and the process was carried to completion by Frederick William I (1713–40). Starting with these contributions of his ancestors, Frederick the Great (1740–85) was able by diplomatic duplicity and military genius to raise Prussia to the rank of a first rate European power and to create that German political dualism which erected a final barrier to German national unification until Austria had been humiliated and ousted in 1866. In the latter part of the 17th century Poland had attained to a degree of power which enabled her to save Christendom from the Turk in 1683, but unfavorable geographical situation, ethnic, religious and social diversity, and unrestrained feudal anarchy prevented Poland from attaining permanent national unity and condemned her to a steady decline and then to a century and a half of dismemberment and servitude. Even semi-Asiatic Russia did not remain immune in this general European process of national differentiation and centralization. Under her barbarous and brutal, but able, Tsar, Peter the Great (1696–1725), political power was centralized, a national royal army was established, European manners and customs introduced and Russian foreign policy given a westward orientation. By 1721 the Baltic provinces had been taken from Sweden and the all-important "window to the west" secured. While neither Prussia nor Russia were seriously affected directly by the Commercial Revolution, the growth of nationalism in these states during the 17th and 18th centuries was indirectly almost wholly a result of the political reactions of this great economic movement. In both states the nationalistic policies were adopted as a direct and obvious imitation of the administrative and military methods of the monarchs of the new order of national states. The Great Elector aped the policies, methods and measures of Richelieu, Mazarin and Louis XIV, and Frederick I took as his model William III of England. Peter the Great learned from England and Holland the secrets of the new industry and commerce, while from Louis XIV he obtained his pattern for political centralization and military reorganization. By the middle of the 18th century, then, national states had been created in most of Europe. Only in Germany, Italy and the Balkans was this process postponed until the next century, with results so disastrous to humanity at large.

The growth of nationalism during the period of the Commercial Revolution was forwarded by other forces than political centralization. The narrow and selfish nationalistic commercial policy, known as "Mercantilism," which developed more or less universally after 1500 as the general body of economic and commercial doctrines which governed European trade and industry until the middle of the 19th century, operated strongly in the way of increasing national consciousness, self-interest and jealousy, and was a potent stimulant to international friction. Commerce during this period became little better than a collective or national piracy, in which the "rights" of other nations were ignored or denied. In addition to this powerful economic impulse to nationalistic and militaristic policies, a strong intellectual influence arose in the remarkable development of vernacular literature after the spell of the classical revival, known as "Humanism," had passed. Italy produced Machiavelli, Guicciardini, Ariosto and Tasso; France, Rabelais, Montaigne, Corneille, Molière and Racine; Spain, Cervantes, Lope de Vega and Calderon; Portugual, Camoëns, Miranda and Ferreira; England, More, Spenser, Shakespeare, Jonson, Marlowe, Bacon and Milton; Germany, Sachs, Ayrer, Opitz and Fleming. Even Holy Scripture was no longer a unifying force in literature, but in the translation of Luther and the King James Version became a powerful vehicle in the development, popularization and improvement of the vernacular language and a subtle and effective force making for nationalistic divisions. The vernacular literature not only gave literary expression to the growing differentiation of national cultures, but constituted a national possession of first-rate importance, which served as a patriotic inspiration for the generations to come. When the religious divisions created by the Reformation coincided with national boundaries they constituted a formidable psychic force making for national cohesion and self-satisfaction. Before the end of the 18th century, then, Europe had ceased to be either feudal or imperial and had come to be primarily national in political organization, economic policy and intellectual tastes and expression. What was further needed to perfect the nationalistic system was the psychological thrill furnished by the French Revolution and its results, and the provision of a real nervous system for the new nationalism in the improved or revolutionized methods of communication and transportation which came as a part of the Industrial Revolution.

IV. The French Revolution, the Napoleonic Period and the Popularization of National Sentiment in Europe.

The Commercial Revolution was not only the most potent force leading to the creation of the dynastic national state, but, curiously enough, it also contributed more than anything else before the Industrial Revolution to its ultimate downfall. The middle class, which it created and advanced in power and prestige, in time turned against the kings in the more progressive countries of western Europe, destroyed the dynastic state and brought into being that control by the middle class which was to prepare the way for the growth of 19th century democracy. The nature and significance of this all-important revolt of the middle class against the dynastic state is effectively set forth by Professor Hayes in the following illuminating citation: «Driven on by insatiable ambition, not content to be lords of the world of business, with ships and warehouses for castles and with clerks for retainers, the bourgeoisie placed their lawyers in the royal service, their learned men in the academies, their economists at the king's elbow, and with restless energy pushed on to shape state and society to their own ends. In England by the close of the 17th century they had helped to dethrone kings and had secured some hold on Parliament, but on the Continent their power and place was less advanced. For the 18th century was still the grand age of monarchs, who took Louis XIV as the pattern of princely power and pomp. ‹Benevolent despots› they were, these monarchs meaning well to govern their people with fatherly kindness. But their plans went wrong and their reforms fell flat, while the bourgeoisie became self-conscious and self-reliant, and rose up against the throne of the 16th Louis in France. It was the bourgeoisie that started the revolutionary cry of ‹Liberty, Equality, Fraternity,› and it was this cry in the throats of the masses which sent terror to the hearts of nobles and kings. Desperately the old order — the old régime — defended itself. First France, then all Europe was affected. Revolutionary wars convulsed the Continent. Never had the world witnessed wars so disastrous, so bloody.» Along with the destruction of the dynastic aspect of the early national state, there came an intensification and popularization of national sentiment quite unknown in the earlier autocratic form of political organization.

As in England there was witnessed the first emergence of the dynastic national state, there also the middle class first came into power, due primarily to the more complete influence of the Commercial Revolution there than elsewhere. In 1649 the English middle class beheaded a would-be autocratic king and 40 years later they completed the process of putting the middle class in political control by driving his son into exile when he attempted to ignore the constitutional barriers to the exercise of unlimited royal power. In France the «bourgeoisie» did not triumph until a century later. In 1614 they had been too weak to defy the monarch and the feudal nobility, but in 1789 and the following years they gave objective evidence of their increase of power during the previous century and three-quarters by crushing both royalty and nobility and establishing themselves as the supreme power in the state. Threatened by the exiled French aristocracy and their foreign sympathizers, the Revolutionists, held together by the new shibboleth of *fraternité,* arose as a «nation in arms» to defend their freshly won liberty against the champions of the old régime. A vast change took place in the nature of national sentiment as a result of this popularizing force of fraternity. At the close of the 17th century Louis XIV had held that the state and the monarch were one and the same; at the close of the 18th bourgeois officials were declaring that the *nation* had a glorious existence quite independent of the king. Professor Hayes has well expressed the importance of this new Revolutionary watchword of «Fraternity» in the process of popularizing the sentiment of nationalism. «Of all the political and spiritual elements in the ‹old régime› of the 19th century, one of the most stubborn and impressive was the growth of nationalism. Taking definite form in the days of the French Revolution, under the fair name of fraternity, it appeared as a revolt of a self-conscious people in behalf of their individual liberty and equality against the tyranny or inefficiency of contemporaneous divine-right institutions. By the French idea of fraternity every European country was soon affected, so that formerly latent sympathies were galvanized into a most lively sentiment, and theorists from the domains of history or philosophy or even of economics could find popular approval for their solemn pronouncements that people speaking the same language and sharing the same general customs should be politically united as nations.» As a result of the 23 years of general European war following 1792, the national sentiment of well-nigh every European country was transformed from the autocratic and dynastic type to a popular form, generally diffused through the whole body politic. This came about either directly, where Napoleon conquered and carried the French reforms, or indirectly, as a defense reaction against the great military genius of the time by the other states which found it necessary to arouse a similar patriotism in their citizens in order to cope with Napoleon. The French Revolutionary patriotism was carried directly from France into the Rhine provinces, Italy and Poland and appeared as a defense reaction in the Germanies, particularly Prussia, in Spain and her colonies and, to a lesser degree, even in England and Russia. No state in Europe wholly escaped the wave of patriotic enthusiasm that swept over Europe from 1792 to 1815. The remarkable contribution of Napoleon to the growth of nationalism in modern European history, through giving a widespread dissemination to the forces and tendencies of his time, is thus stated by Professor Robinson: «So long as states were composed of *subjects* rather than of *citizens,* the modern emotions of nationality could scarcely develop. Nationality, in our meaning of the term, is a concomitant of another mystical entity, democracy. The French Revolution began, it is true, in a period of philosophic cosmopolitanism, since that was the tradition of the *philosophes,*— and the French armies undertook to liberate other peoples from their tyrants in the name of the rights of *man,* not of *nations.* But Napoleon, in a somewhat incidental and left-handed fashion, did so much to promote the progress of both democratic institutions and of nationality in western Europe that he may, in a sense, be regarded as the putative father of them both. His plebiscites were empty things in practice, but they loudly acknowledged the rights of peoples to decide on vital matters. He was a friend of constitutions —so long as he himself made them. Then his attempt to seat brother Joseph on the Spanish throne produced a really national revolt, and led to the Spanish constitution of 1812 and all its later revivals and imitations. In Italy he stirred a desire for national unity and the expulsion of the foreigner which had been dormant since the days of Machiavelli's hopeless appeal. He is the founder of modern Germany. He succeeded in a task which had baffled German emperors from the days of Otto the Great; for in 1803 he so far consolidated her disrupted territories that the remaining states, enlarged and strengthened, could in time form a strong union and become a great international power. His restrictions on the size of the Prussian army after his victory at Jena suggested to Scharnhorst, Gneisenau and Boyne a subterfuge which made Prussia the military schoolmaster of Europe, and cost the millions of lives since offered up in the cause of nationality.» To these European effects of the influence of the Napoleonic period upon the growth of nationalism should be added the contagion of this process which extended to America. The rise of national independence in Latin America was immediately related to the influence of Napoleon upon Spain. As Mr. Fisher has said: «If the South American democracies value their independence, statues of Napoleon might with propriety be raised in the squares of Valparaiso and Buenos Ayres.» The naval and commercial aspects of the struggle between England and France greatly stimulated that development of national unity in the United States which was involved in the preparation to meet the insults to this country and the ravages on its trade. Finally, the purchase of Louisiana, made possible by Napoleon, was the greatest nationalistic event in the first half century of our history as an independent state. So great was the momentum which the popularized sentiment of nationality gained that not even Metternich, the most astute statesman of the first half of the 19th century, could check it. In spite of his temporarily successful efforts to leave Italy and Germany mere «geographical expressions» in 1815, the arrangement he produced was cast to the winds by those great nationalistic statesmen Cavour and Bismark in the unification of Italy and Germany, while the national sentiment surged violently, if with less success in gaining full political expression, in Greece, the Balkans, Bohemia, Poland and Hungary. But the French Revolution, as the final political and nationalistic expression of the Commercial Revolution, only gave the initial impulse to this new or democratic phase in the development of nationality. A much more profound revolution was already in process of development in the factories and mines of England, and the greatest transformation in the history of the race was there being prepared, which could not fail to have a far-reaching reaction upon the growth of national sentiment and the activities and attitudes of the national states.

V. THE INDUSTRIAL REVOLUTION, NATIONAL IMPERIALISM AND THE LATEST STAGE IN THE EVOLUTION OF NATIONALISM.

The term «Industrial Revolution» was given by W. S. Jevons and Arnold Toynbee to the great series of mechanical inventions that followed the introduction of John Kay's «flying shuttle» in 1738 and have completely transformed the economic, political and social, as well as most of the intellectual, foundations of civilization. The general significance of the Industrial Revolution has been eloquently set forth by Professor Shotwell in the following quotation: «It has brought into existence a vast working population, embodied in iron and steel, drawn from mines and forests, from steam, gas and electricity by the mysterious genius of the human brain. It has transformed the face of nature and the life of the whole world. These are not mere economic facts. They form the largest and most wonderful chapter in the history of mankind. What is the Renaissance or Reformation, the empire of Charlemagne or of Cæsar, compared with this empire of mind and industry, which has penetrated the whole world, planting its cities, as it goes, binding the whole together by railroad and telegraph, until the thing we call civilization has drawn the isolated communities of the old régime into a great world organism, with its afferent and efferent nerves of news and capital reaching to its finger tips in the markets of the frontier. A nickle spent for thread in Uganda sets the spindles going in Manchester. Fellaheen by the Nile may be starving because the cigarette factories are building marble palaces for their owners on the banks of the Hudson.» Following as a result of the industrial conditions necessitated by the mechanical inventions came the «factory system» and the growth of the modern industrial cities, with all of their attendant social and economic problems. This meant not only a concentration of the industrial population in the newly-created manufacturing cities, but also the completion of the process of separating capital from labor and the creation of the interrelation between them that has colored the social and economic history of the last century. Socially and politically the most important results of this sweeping transformation were the great increase in the number and strength of the middle or capitalistic class and the creation of the industrial proletariat. The struggle between these classes and of both of them against the landed aristocracy has been the centre of the political history of the last hundred years and the chief dynamic force in the growth of political democracy. The development of means of the communication of intelligence, through the railroad, telegraph, telephone and cheap newspapers, made possible a real psychological unity within each nation, broke up local isolation and completed the process of popularizing national sentiment and perfecting national self-consciousness. It made the various national manifestations of «herd-instinct» more communicable, more responsive and more liable to sudden and hysterical explosions. So fundamentally primitive was the general level of thought and interests on the eve of the Industrial Revolution that the sudden development of the means of communicating these throughout the modern national state tended to give to national thought and emotion the same narrowness and self-satisfied provincialism that had earlier prevailed on a smaller scale. Therefore, it is not surprising that Professor Robinson finds that «Our ancient tribal instinct evidently retains its blind and unreasoning characteristics despite the fact that we are able nowadays, by means of newspapers, periodicals, railroads and telegraphs, to spread it over vast areas, such as are comprised in modern states like Germany, France, Russia and the United States.» The world-wide extension of the new mechanism of communication also rendered jingoistic expressions in foreign countries better known and more likely to arouse national antagonisms. Finally, as will be evident from the following discussion, the Industrial Revolution was the most influential force impelling the great modern national states to undertake the building up of new colonial empires in the era of modern imperialism since 1870.

The European Revolutions of 1848 seemed to bring to a focus the two great principles of the first half of the 19th century — nationality and democracy — which had been produced by the combined action of the French and Industrial Revolutions, and for the moment gave promise of making possible the dream of the European liberals that a political order might be created which would give full recognition to both of these aspirations. The enthusiasm thus stirred among the nationalists and democrats in Europe during these momentous years has been eloquently set forth by Mr. Bryce: «So the sympathy, both of America and of Britain, or at least of British Liberals (among whom was then to be found a great majority of the men of light and leading), went out when, in 1848, the crash of the Orleans Monarchy in France had shaken most European thrones, to the Italian revolutionaries, to the Polish revolutionaries, to the Czechs in Bohemia, to the Magyars in Hungary, who, under the illustrious Kossuth, were fighting in 1849 for their national rights against Hapsburg tyranny, to the German patriots who were trying to liberalize Prussia and the smaller kingdoms, and bring all Germans under one free constitutional Government. Men hoped that so soon as each people, delivered from a foreign yoke, became masters of their own destinies, all would go well for the world. The two sacred principles of Liberty and Nationality would, like twin guardian-angels, lead it into the paths of tranquil happiness, a Mazzinian paradise of moral dignity and liberty, a Cobdenian paradise of commercial prosperity and international peace.» But the tragic sequence of events in 1848–49 proved that nationality and democracy could then scarcely co-operate in harmony; national jealousy and particularism weakened the cause of democracy and ultimately led to the temporary downfall of both before political reactionaries and anti-national imperialists. The liberals of 1848 believed that when tempered with democracy nationality would be divested of its chauvinistic and aggressive qualities and would insure the coming of perpetual peace, but, as Professor Blakeslee has made clear, neither history nor theory can justify this view: «During the past century the great democracies have been making war, threatening war, and preparing for war, much of the time against each other. Their history shows clearly enough that if their neighbors had also been democratic this change alone would not have prevented wars. Nor is the outlook for the future encouraging. Democratic nations are still willing to fight to defend their national interests and policies; they demand their due share of over-sea trade, concessions and colonies — if they are a commercial or expansionist people — no less insistently because they are democratic. But the interests and policies of one nation conflict with those of another; what one democracy regards as a due share of over-sea trade, concessions, and colonies is an undue share to its rival. Each democracy becomes an excited partisan of its own view, ready to back it by force of arms; and the natural result is, as it always has been, wars and rumors of wars. There are enough conflicts in national policies to-day to lead to a dozen future conflicts, even if all the world should be democratic. There is Japan's insistence upon controlling China; our own Monroe Doctrine, when interpreted in a domineering or selfish spirit; England's Persian Gulf policy; the anti-oriental policy of the United States and the British self-governing colonies; the expansionist policy of all the Balkan states; and the Entente policy, formulated at the Paris Conference, of discriminating against the trade of the Central Powers after the present war shall be over. Unless present conditions are changed, the democratic nations of the world, with their conflicting interests, would find it difficult to maintain world peace, for the next century, even if they wished to maintain it. History, present conditions, and the logic of the situation show that democracy alone will never make the world safe. It is only by a definite concert of states that we may secure a reasonable promise of obtaining a permanent international peace and of becoming a non-militaristic world.» The following discussion will show that the more perfect recognition and realization of nationality has as yet achieved even less than democracy to produce the political millennium; rather it has seemingly merited Lord Acton's indictment that «there is no principle of change, no phase of political speculation conceivable which is more comprehensive, more subversive, more arbitrary than nationality. Its course will be marked with material as well as moral ruin, in order that a new invention may prevail over the works of God and the interests of mankind.»

The 19th century witnessed the belated completion of national unification in two major European states—Germany and Italy—through the efforts of Bismarck and Cavour in the decade and a half following 1855. These statesmen, in deep sympathy with the national aspirations of their countrymen, gathered together under their leadership the various forces working in this direction and succeeded in giving concrete and effective expression to the generally diffused impulse to political unification. In a very real sense they may be regarded as having carried to completion the forces and tendencies first aroused in their respective states by the reactions to the French Revolution and the Napoleonic conquests and statesmanship. Not only were the patriotic tendencies, at the head of which they put themselves, originally set in action by the Revolution and Napoleon, but also the main obstacle to national unification which had to be overcome in both states was the antagonism of that inveterate and implacable enemy of Napoleon and the «French Ideas» — the anachronistic empire of the Hapsburgs and Metternich. The work of Cavour and Bismarck marked a significant stage in that incessant warfare against the mediæval imperial concepts and practices which had begun at Westphalia in 1648, was carried on at Utrecht and in the creation of the Confederation of the Rhine, and finally ended in the utter collapse of that obsolete and oppressive political structure in the autumn of 1918, as a result of the growth of national sentiment among its subject peoples and the blow to its military prestige by the collapse which marked the close of the «War of the Nations.» Force, chicanery, duplicity and intrigue were employed about equally by both Cavour and Bismarck in achieving their justifiable ambitions, but the resulting political systems created were widely different. «Blood and iron» and *Realpolitik* were used by Cavour merely as a means to the end of creating a liberal and pacific state and a parliamentary government, while with Bismarck they became ends in themselves and were used to repel the very liberalism and democracy which Cavour had established. The temporary vindication of brute force and autocracy in Germany, as a result of the success of Bismarck from 1862 to 1871, gave them tremendous prestige in the newly-formed empire and served to give color to the subsequent history of Germany and the world.

In addition to these larger national states which have appeared upon the European map since 1815, a number of smaller nations have attained in part, at least, to statehood. Greece attained independence in 1829; Belgium gained its independence in 1830 and its neutralization in 1839; Luxemburg became an independent neutralized state in 1867; Serbia, Rumania and Montenegro were recognized as states in 1878; Norway separated from Sweden in 1905; Bulgaria took advantage of the European confusion and tension of 1908 to declare her complete freedom from Turkey; and in 1913 Austria perversely created the independent Albanian state to block Serbia from an outlet to the sea. But in spite of this considerable addition to the «family of nations» in Europe, national aspirations were by no means satisfied by 1914. Not only did the political map fail to coincide with the national boundaries in the case of every one of the European national states created during the 19th century, but there were great historic nations like the Poles, the Irish, the Czechs of Bohemia and the Finns which were denied any independent political existence. Had the psychology of peoples been the same in 1914 that it was a century and a half before, this condition of incomplete national independence would have produced no very great problem, for potential nations as distinct in race, language and historical traditions as they were at the beginning of the 20th century had long lived without complaint when subjected to the oppression of alien peoples. But the perfection of the dynastic national state, the psychological contagion generated by the French Revolution, the defense-reactions produced by the Napoleonic conquests, the effect of the democracy brought into being by the Industrial Revolution, and their net result in arousing the quiescent «herd-instinct» and in giving it a nation-wide field of operation made any attempt to deny national aspirations a forlorn hope. A boisterous and intolerant chauvinism had developed in the greater states of Europe which inevitably reacted upon the «repressed nations» and aroused similar sentiments and ambitions there. This tendency was powerfully forwarded by the attempt of the great national states to crush out by persecution the national aspirations of the subject nations within their boundaries. Germany oppressed the Poles; Russia the Finns, Letts, Lithuanians, Poles and Ruthenians; Austria the Czechs, Slovaks, Poles and Serbs; Hungary the Rumanians, the Ruthenians and the Croats; and Turkey portions of most Balkan nations and the embryonic nations of Asia Minor. Further, these lesser or «oppressed» nations followed the example of the greater states in arousing an interest in national history and literature and thereby stimulated their hopes for independence by centering attention upon the past glory of their peoples, be it as remote as classical times or the early Middle Ages. Nothing could thwart this force — not even the oldest monarchy in Europe nor the mightiest military state which the world has yet seen. The general nature of the friction and dissatisfaction felt in the Europe of 1914 over the failure of the political divisions to coincide with the national groupings has been admirably summarized by Professor Hazen in the following synoptic outline:

«1. Dissatisfaction in Germany on the part of
    a. The people of Alsace-Lorraine;
    b. The Poles of Eastern Prussia;
    c. The Danes of Northern Schleswig.
2. Dissatisfaction in Denmark over
    a. The position of the Danes in Northern Schleswig.
3. Dissatisfaction in Austria-Hungary on the part of
    a. The Czecho-Slovaks;
    b. The Rumanians of Eastern Hungary;

3. Dissatisfaction in Austria-Hungary on the part of — *Continued*
    - c. The South- or Jugo-Slavs;
    - d. The Italians of the Trentino, Istria, and Trieste.
4. Dissatisfaction in France over
    - a. Alsace-Lorraine.
5. Dissatisfaction in Italy over
    - a. Italian Irredenta — Trentino, Istria, Trieste.
6. Dissatisfaction in Serbia over
    - a. The oppression of millions of Serbs by Austria-Hungary;
    - b. Lack of outlet to the sea.
7. Dissatisfaction in Rumania over
    - a. The oppression by Hungary of millions of Rumanians.
8. Dissatisfaction in Bulgaria over
    - a. The boundaries laid down by the Treaty of Bucharest, 10 Aug. 1913.
9. Dissatisfaction in Greece over
    - a. Turkish rule of millions of Greeks.
10. Dissatisfaction of the Poles over the fact
    - a. That Poland does not appear upon the map of Europe, but has been divided among and incorporated with the three partitioning powers of the 18th century, Russia, Prussia and Austria.
11. Dissatisfaction in Russia on the part
    - a. Of the Poles;
    - b. Of the people of Finland, etc.»

To these, obviously, should be added the dissatisfaction felt by the Irish nationalists, who, in spite of the eloquent appeals of O'Connell and Redmond and the sympathy they aroused in Gladstone and the English Liberals, were denied their aspiration for «home rule.» Joined to these sources of friction and unrest produced by the imperfect realization of patriotic aspirations among oppressed national groups, there were deep-seated and ominous rivalries among the great national states of Europe over purely European national problems. From 1870 to 1914 France was mourning over her «lost provinces,» draping the Strassburg Statue and perpetuating the ceremonials of «revanche,» while Bismarck alleged that Germany was maintaining and increasing her great armament solely as a protection against the contemplated French war of «revanche,» so fiercely urged by Déroulède and his fellow patriots. In spite of a formal alliance, Austria and Italy were fundamentally at odds over the solution of the problem of «Italia Irredenta.» The «Mittel-Europa» plan of Germany and Austria was diametrically opposed to the Pan-Slavic scheme of Russia as well as to the national aspirations of the Balkan states. Finally, England's jealousy over Russian longing for Constantinople, which had led her into an aggressive and costly war in 1854–55, was never removed until the mutual loot and partition of Persia was consummated in 1907.

But ominous and troublesome as were the rivalries of national states in Europe over continental problems, these were as nothing compared with those which arose from the struggle over the opening up of backward countries for investment and the planting of colonies in lands beyond the sea. From the period of the close of the Napoleonic wars to 1870 there had been a decided decline in imperialistic enterprises. Under the reign of «economic liberalism» European countries even went so far as to discuss the very desirability of colonies, and Richard Cobden and his followers believed that the British Empire was quite as much an English liability as an asset. But the results of the Industrial Revolution put an end to this amiable «cosmopolitan dream» of the Cobdenites and produced the revival of the old Mercantilistic policy in the shape of a new scramble for the remaining unappropriated parts of the earth, which could be utilized as colonies and markets for the greatly increased volume of manufactured products. The relation between the great increase of production, caused by the various phases of the Industrial Revolution, and the new national imperialism has been admirably stated by Professor Schapiro in the following passage: «Toward the end of the 19th century there took place a new Industrial Revolution, the results of which were almost as startling as those of its predecessor a century before. The application of science to industry through the extraordinary development of the chemical and physical sciences, the better organization of business enterprise through combination, the larger use of capital and the opening up of new sources of raw material in Asia and Africa increased many fold the production of goods. Gigantic plants, equipped with scientific laboratories, worked by armies of laborers, and capitalized by millions of dollars, brought together in syndicates and ‹trusts,› displaced the small factories, or ‹mills,› as they were still called. It is estimated that the average increase in the commerce of all the countries of Europe during the 19th century was over 1,200 per cent. . . . The Industrial Revolution at the beginning of the 19th century transformed the economic life of Western Europe only; the new Industrial Revolution at the end of the century caused Europe to burst her industrial bonds and to encompass the entire world in its influences. The new industrialism multiplied production so enormously that markets had to be sought outside the limits of the home country. As competition for the home market within the leading industrial countries became very keen, the eyes of the captains of industry were naturally turned to the many regions that were at the same time densely populated and industrially undeveloped. The vast populations of Asia and Africa were so many potential customers for the business men of Europe. What fabulous profits awaited those who got the opportunity of clothing and shoeing the teeming millions of Chinese and Hindus!» This process of national expansion overseas, in its second or recent phase, set in about 1870, when the effects of the Industrial Revolution had been felt in England and France and were beginning to be experienced to an ever greater degree by Germany. France turned to Africa and Asia, and in Tunis, north central Africa, Morocco and Indo-China sought compensation for the territorial loss of Alsace-Lorraine and investment opportunities for her growing body of capitalists. To obtain a more complete control over the routes leading to India, Disraeli bought the large block of Suez Canal stock in 1875 and started Great Britain on her second experiment in empire building, which added to her already extensive territorial possessions, Egypt, the Sudan, South Africa, Nigeria, southern Persia and Tibet. Russia extended her sphere of political and economic control in the Far East in the region of Manchuria, and also in the district about the Caspian Sea, including the northern half of Persia. Germany sought her «place in the imperialistic sun» by colonization in Africa and in the islands of Oceania and the Pacific, and by an attempt at the economic control of Asia Minor and Mesopotamia through her Berlin-Bagdad railroad project. Italy, after an unsuccessful attempt to get control of Abyssinia, was compelled to remain content with Somaliland and Eritrea until she was able, 15 years later, to wrest Tripoli and Cyrenaica from Turkey. Finally, nearly all of the above-mentioned states participated in the economic, if not the political, partition of China. The conflict of ambitions in this process of European expansion created many centres of international friction. Germany and England clashed over the distribution of territory in South Africa and over the control of the Persian Gulf. France and Germany precipitated three European crises over their disputes concerning Morocco. France and England nearly went to war over the territory surrounding the source of the Nile. Russia went to war with Japan over Manchuria and Port Arthur, and came to an agreement with England concerning Persia only by a mutual division of spoil in the agreement of 1907. In addition, this new imperialism served to stimulate national pride and aggressiveness on the part of the great national states of Europe through the development of the «mapitis» psychosis, namely, the enthusiasm or chagrin felt by the citizens over the success or failure of their respective states in covering the map of the world with the brilliant colors designating their colonial possessions. Finally, the struggle for markets and the desire to protect national trade and economic interests led to the practical institution of a neo-Mercantilistic era of protective tariffs. Beginning with the Bismarckian tariff bill of 1879 there ensued a general European movement toward nationalistic protective tariffs so high that they would have caused even Frederick List to gasp with astonishment if not with dismay. Only England escaped from this tendency to introduce what practically meant an economic war between the various continental European states. In this manner were economic and political events in and out of Europe contributing to the stimulation of jingoism and international distrust and suspicion in the generation preceding the coming of the calamity of 1914. The writings or speeches of Peters, Reventlow, Rohrbach, Tannenberg, Delcassé, Barrès, Rhodes, Kipling, Maxse, Lea, D'Annunzio, Crispi, Sonnino, Pobiedonostsev, Von Plehve, Berchtold and Tisza presented to the world evidence of the various grandiose programs of national expansion and served to stir up mutual suspicion and antagonism. That this dangerous state of mind in Europe was most marked in Germany was probably due more than anything else to the delayed nature and the forcible methods of her national unification, to her rapid and unprecedented economic development since 1870 and its resulting impulse toward imperialistic expansion, and to the fact that the «stigmatic» discrepancy between relative European prestige and relative extent of colonial possessions was most marked in the case of Germany. The diplomacy of the latter part of the 19th century and the beginning of the 20th was very poorly adapted to meeting this difficult task of reaching a peaceful adjustment of conflicting international claims. While there can be no doubt that diplomatic theory and practice made great strides in advance during the last century, it is equally certain that it was still essentially Machiavellian, and, as Mr. Weyl has well expressed it, was still controlled by «the approved diplomatic type, the aged, bemedaled, chilly, narrow and conservative, Excellency, very gentlemanly, very astute, fundamentally stupid.»

The prospect of a peaceful settlement of the disputes between the European states over European and imperialistic problems was greatly diminished by the vast armaments which were created and increased, ostensibly in the interest of preserving peace, but actually, as subsequent events have proved, to encourage an aggressive nationalistic policy of expansion and annexation. In its origin this militaristic movement dates back to the French Revolution. In 1793 France first introduced the policy of conscription on a general scale and confirmed this practice by law five years later. To prepare for the War of Liberation and to evade Napoleon's arbitrary limitation of the Prussian army to 42,000 men, the Prussian military leaders, Scharnhorst, Gneisenau, Boyne, Grolmann and Clausewitz, introduced into Prussia the system of universal liability to military service in the years following 1808. Austria, in the attempt to cope with Napoleon, tended in the same direction under Archduke Charles and Count Stadion. After 1815 there was a decided slump in military sentiment and activity, associated to some degree with the prevalence of «economic liberalism» and its cosmopolitan tenets. The first military revival was the work of Napoleon III, who assured France and Europe that «the Empire meant peace,» but gave practical proof that it meant a restoration of the military traditions of his illustrious uncle. But the Napoleonic restoration of the militarism of a half century earlier was much less consequential for the world than the contemporaneous developments across the Rhine. To revenge Olmütz and humble Austria, King William I of Prussia planned to reorganize the Prussian army as it had been in the great struggle against the first Napoleon. Calling to his aid, in 1862, the most sinister figure in the history of modern militarism, Otto von Bismarck, he was able to carry out not only his army plans, but also his fond ambition to defeat Austria. Extending the new system to the North German Confederation, Bismarck was able to crush France and bring about the long desired unification of Germany. Having «vindicated» the policy of «blood and iron» by three victorious wars Bismarck fastened militarism upon Germany with a deadly grip by a series of laws passed between 1873 and 1887, and the military octopus grew until it culminated in the preposterous act of 1913. The Prussian system, with its great prestige, set the military pace and example for the rest of continental Europe. France adopted the Prussian system in 1872, and most of the other Great Powers, as well as the lesser Balkan states, did the same in the decade of the «seventies.» Even Turkey, in 1883, invited Von der Goltz to reorganize the army of the Sultan on the German plan. Nor was the increase in armament limited to land forces; the great extension of the new colonial enterprises and the development of a larger merchant marine seemed to demand new and larger navies. In view of Great Britain's greater colonial possessions and trade it was but natural that she should begin the movement for larger sea forces. In 1889, Great Britain passed an act providing for a vast increase in her fleet and initiated that policy of keeping her naval strength far in advance of any rival state. Not until 1898 did Germany's interest in «Weltpolitik» lead her to attempt to rival Britain on the seas, but in that year there was passed the first great German naval act, which was supplemented by other more pretentious increases in acts of 1900, 1906 and 1912, which served to arouse British alarm and enmity and to make an Anglo-German concord extremely improbable. Nor were England and Germany alone in this process. All the leading powers, but especially France and Russia, followed their lead. With these great war machines at hand, the European states were little inclined to submit their conflicts and disputes to what were regarded by the jingoistic patriots and imperialists as the pusillanimous and ignoble methods of diplomacy and arbitration.

Accompanying these political and economic forces making for a greater prevalence of jingoism in the last generation of European history, there were psychological causes operating which were not less effective in promoting national aggressiveness and mutual hatred, suspicion and contempt. Anthropological fallacies, growing out of Gobineau's grotesque 'Essay on the Inequality of the Human Races' (1854) and Max Müller's hasty generalizations in his 'Lectures on the Science of Language' (1861) led to an inflation of racial egotism, the intensification of racial misconceptions and the fatal if fruitless search for the original «Aryan» bearer of civilization among the nations of Europe. That writers more patriotic than scientific could find certain and irrefutable evidence for the original habitat of the primordial «Aryan» in France, Germany, Italy and Russia is sufficient evidence not only of the hopeless scientific confusion, but also of the disastrous patriotic ardor that invited the search. Pseudo-Darwinian sociology represented war as the supreme principle making for social progress, as the struggle for existence had advanced biological evolution. This distortion of half-truth by Gumplowicz and his school was eagerly seized upon by the military and ultra-patriotic writers, such as Moltke, Bernhardi and Von der Goltz in Germany, Déroulède and Barrès in France, Lord Roberts, Wyatt, Cramb and Maude in England, and Lea, Maxim, Mahan and Gardner in America, to give a semi-scientific cloak for their class and clique interests and ambitions. Super-patriotic history, literature and philosophy magnified the past glory and the future heritage of each nation and proportionately disparaged the past and future of their rivals. The emotional impulse from «Romanticism» led to a greatly increased interest in the study of national history. This was augmented by the patriotic enthusiasm accompanying the growth of nationalism following the French Revolution and the Napoleonic Era. Every country began the compilation of gigantic collections of the sources of national history, of which the 'Monumenta Germaniæ Historica,' the «Documents inédits» and the «Rolls Series» were only the most notable among many similar enterprises. National narrative histories breathing forth a fiery and defiant patriotic ardor were produced by Giesebrecht, Droysen, Treitschke and Sybel; Michaud, Raynouard, Mignet, Lamartine, Guizot, Thiers, Michelet and Martin; and Freeman, Stubbs, Froude, Carlyle, Macaulay and Napier. Literature became even more chauvinistic. Houston Stuart Chamberlain, building on the risky foundations of the anthropological fallacies of Gobineau, Pösche and Penka, was able to discover that almost without exception every important figure in history since the beginning of the Christian era had been a German. Even Saint Paul, Dante, Giotto, Michael Angelo and Raphael were included by this undaunted exponent of «Kultur» under the caption of «We Teutons!» Nisard detected the very essence of Reason, herself, in the spirit of French literature. Maurice Barrès found that French culture was a precious and indigenous product of Celtic blood, to which neither Roman nor Teuton had contributed in the slightest degree, and he advocated its preservation by making it the centre of a near Japanese cult of ancestor-worship. Léon Daudet found that nations other than the French exhibited undoubted stigmata of mental and moral decline or deficiency. Rudyard Kipling, the poet of «Saxondom» and British imperialism, indulged in frenzied injunctions to his countrymen urging a greater assumption of the «white man's burden» throughout the non-European world. Carducci made the heroes of Italian unification the theme of the greatest of modern Italian poetry, while d'Annunzio wrought himself up into a neoplatonic ecstasy over the necessity of reclaiming Italia Irredenta. Patriotic state education taught unquestioning loyalty to state or dynasty as the first principle of moral conduct, carefully obscured any questionable occurrences or policies in the national past and frowned on criticism and progressive reform proposals. Slowly, but surely and wilfully, Europe was preparing for the cataclysm of August 1914. As Professor Sumner long before predicted, the vast armaments that had been prepared with the avowed purpose of defense alone invited the transformation of nationalistic and military philosophy from the advocacy of a purely «defensive war» into an exposition of the virtues and necessity of a «preventive war.» That this process of the cumulative growth of national egotism and aggressive militarism was undoubtedly most marked in Germany has not obscured the fact that she was separated from the other European national states in this respect by a difference in degree rather than in kind, and that she was able to bow the necks of her citizens under the burden of the military octopus primarily because of the welcome evidence that her neighbors gave to the German military class that they were not unwilling to submit the «rectitude» of their cause to the «test of arms.» Nationalistic and ultra-patriotic intoxication rather than unique Teutonic perversity «applied the match to the European powder-house» in 1914, and if Germany was the only nation which had lost rational and moral self-control, none of her opponents could present an unchallenged record of total abstinence.

While the rise of modern nationalism has been most conspicuous in Europe, this should not obscure the fact that similar forces have produced analogous developments elsewhere, most notably in America and Japan. To an astonishing degree the growth of national unity and of national sentiment in both of these more recent cases of the rise of nationalism has been the product of the same general circumstances and conditions which promoted the development of nationalism in Europe, though in most respects these influences did not have a wholly indigenous origin and expansion, as in Europe, but were introduced from abroad.

Of the American examples of the rise and growth of nationalism that of the United States has, of course, been the most significant. As Professor Cheyney has so convincingly pointed out, the settlement of the United States was quite as much connected with the economic impulses arising from the Commercial Revolution in Europe as it was with the religious revolt from Catholicism and the Established Church of England. Even more consequential were these new commercial forces in promoting unity among the colonists. A century of mutual ignoring of British commercial restrictions had given the 13 colonies a strong common motive for unified action in opposing the proposed enforcement of these long dormant Mercantilistic restrictions — a motive which Professor Schlesinger has recently shown to have been far more powerful than any theoretical or legal abstractions involved in the colonial movement of resistance to British imperial power. In addition to these economic foundations of the shaping of American national sentiment there was a fundamental sociological process in operation which has been aptly termed by Professor Becker «the beginnings of the American people.» A widely different geographical, social, political and economic environment acting upon a population originally psychologically variant from the great mass of Englishmen, tended inevitably to create in the colonies a people who became, generation after generation, more and more divergent from their kinsmen across the Atlantic. Not only were these environmental influences working to produce an essential dissimilarity between Englishmen and Americans, but through the fundamental uniformity of the American social environment there was being created a homogeneous and united American people and the beginnings of a national self-consciousness. The American Revolution, initiated by the enterprising and recalcitrant merchants and debtor landlords and carried to success by their courage and audacity and by the not disinterested aid of the French, furnished a unifying force of very great potency for a temporary period, but the reaction in the period of the Confederation for the time being threatened a lapse into anarchy and dismemberment. Thanks, however, to their desire for financial stability and security, the vigorous capitalistic class, led by that great constructive statesman of early nationalism, Alexander Hamilton, turned the tide of political opinion and practice from separatism and provincialism to nationalism and unity. Their work was carried on by the strongly nationalistic decisions of the great judicial figure in the growth of American nationalism, John Marshall, whom not even Jefferson's enmity could remove. Indeed, the Jeffersonian Republicans, when they came into power in 1800, ceased their negativism and accepted most of the nationalistic program which they had criticized with such vigor and acrimony when carried into operation by Hamilton and Adams. Jefferson could purchase Louisiana, Madison could be won for war with Great Britain, and Monroe could formulate a nationalistic foreign policy. Nationalism in America thus took its origin from the reactions of the Commercial Revolution on the western world; as in Europe, it was completed by the Industrial Revolution. The new factories in the north created an industrial interdependence between the various sections of the country and attracted an immigrant population with no sectional sentiments. The new canals and railroads led to the initiation of that great nationalistic enterprise of the 19th century in America — the conquest of the West, studied with such fruitfulness by Professor Turner and his disciples. While the territorial additions of the middle of the century were temporarily a cause of sectional dispute and friction, they ultimately became a matter of national pride and common interest. Though negro-slavery and the accompanying states-rights movement threatened to disrupt the embryonic nation, the success of the North in the Civil War demonstrated by the verdict of physical force that Webster, rather than Calhoun or Hayne, was right in his interpretation of the nature of the federal union. A permanent political sanction for nationalism was provided by the Fourteenth Amendment. Events and tendencies since the Civil War have been even more conducive to the development of national unity than those of the preceding half-century. An Industrial Revolution, like that which affected New England in the first half of the 19th century, has come to the South and the sharp sectional division of economic characteristics and interests has now been greatly lessened. The further development of railroads, telegraph and telephone lines, and other means of rapid transportation and almost instantaneous communication of intelligence have made this extensive country a national economic and psychological unity to a degree unknown in 1789 even in the meagre territory along the Atlantic seaboard with which the United States started its political existence. The intersectional investment of capital has produced a real financial unity. A national literature has been provided by such writers as Irving, Bryant, Cooper, Longfellow, Lowell, Whitman, Thoreau, Emerson, Hawthorne, Poe, Clemens, Howells and Riley. A collection of the sources of national history was planned and partially executed by Peter Force, and a national historical epic, eulogizing the American past, was created by the writings of Bancroft, Palfrey, Fiske, Holst and Burgess. A «glorious» foreign war at the close of the century gave a great stimulus to the completion of national development, and elaborate national expositions and public projects, such as the Panama Canal, furnish a successive series of impulses to unity. Many pessimistic publicists believed that the great influx of foreigners in the last 50 years threatened national disruption as seriously as the sectional divisions of the middle of the last century, but the experience of the United States in the Great War has definitely disproved their forebodings and demonstrated that whatever the general results of immigration, they have not brought national disintegration. The participation of the United States in the late «War of the Nations» produced a welling-up of exuberant national sentiment and intolerant patriotism which caused even the older allied and enemy European nations to gasp with astonishment. But while national development in the United States has been the most notable exemplification of this process in the western hemisphere, it has not been the only one. Canada, in spite of a titular connection with Great Britain, has developed a very marked spirit of national self-consciousness, while a century of independent political existence has created a strong feeling of national pride and unity in the various states of Central and South America. Nationalism, then, seems as well established in America as in Europe.

There can be no doubt that the most spectacular rise of nationalism in a 19th century state was witnessed in the case of Japan. After having welcomed European adventurers and missionaries in the middle of the 16th century, Japan suddenly turned against the newcomers, murdered them or drove them from her shores and returned to immobility and isolation for three centuries. This artificial aloofness was broken down following 1853 by commercial concessions obtained first by the United States and then by European states. At first, the feudal princes opposed the entry of foreigners and their civilization, but the more far-sighted among them recognized that Japan could hope to compete with the states of Europe and America only by adopting at least the superior mechanical features of their advanced civilization. By the Revolution of 1867–68 and its immediate results, this reforming element abolished the Shogunate, brought the Mikado out of an inactive retirement, terminated feudalism, reorganized the army along European lines, and accepted the industrial methods and processes which had been produced by a century of economic development in Europe and America. Within a period of less than 40 years Japan passed from a mediæval feudal state to a modern industrial nation, though, as in the case of Germany, this change was limited to the mechanics rather than the philosophy of modern civilization. In no modern state is there such an intense devotion to national ideals as is to be found in Japan. The veneration for the past practically reaches a condition of ancestor worship, while patriotism is in a very real sense the official religion of Japan. When to these conditions there is added the abnormally rapid economic evolution of Japan, it is not difficult to recognize why she has been regarded as the «Germany of the Far East.» By successful wars against China (1894–95) and Russia (1904–05) Japan has become the great world power of the Pacific, has acquired important territory on the mainland of Asia and has endeavored to erect and maintain a Japanese «Monroe Doctrine» in China and the Far East. The present-day exponents of internationalism seem likely to find Japan the most tenacious adherent to the old order of aggressive nationalism and imperialism, but it must be frankly admitted that Japan's contact with the diplomacy of the western world could scarcely have taught her that the day of candor, honesty and generosity has yet arrived in the field of international relations. The rise of the new Japan stimulated the great inert mass of China. Stung by the defeat of their country by the microscopic Island Kingdom, the progressive Chinese patriots attempted to guard against another humiliation at the hands of the Japanese by imitating the Japanese adoption of western civilization. While this movement was temporarily obstructed by the reactionary element in the country led by the Dowager Empress, the liberals overthrew the obstructionists by the Revolution of 1911–12, established a Chinese republic and welcomed western industry and culture. While this remarkable transformation was too rapidly consummated to remain secure and unchallenged, it has persisted to a remarkable degree in spite of temporary set-backs, and China seems well on her way toward development into a modernized national state. In conclusion, it should be noted that no observations on the rise of nationalism in the Far East can ignore the remarkable evidences of national self-consciousness in Australia and New Zealand which were brought out by the recent World War.

The disastrous «War of the Nations,» which has just ceased, was not only a product of obsessed nationalism, but also brought with it an unprecedented inflation of national egotism and intolerant patriotism. Never before had a general war occurred when the mechanism for disseminating both information and propaganda was so highly developed or so ruthlessly utilized. The slavish eulogy of national culture and history and the obscuring of national faults and mistakes, which had been so prevalent in the half century before the war, were as nothing compared with the tryannical censorship and unabashed organized propaganda of every state immediately engaged in the conflict. The greater strictness of the German censorship and the more sinister and extensive nature of German propaganda were, no doubt, indicative of the deeper conviction of ultimate guilt on the part of the Teutonic military autocrats, but no warring state escaped from these activities with an enviable record. Each of the opposing groups of powers represented the gigantic conflict as a sort of Persian eschatology — a struggle between the forces of light and darkness, a clash of the powers of righteousness and iniquity. Within each state an attempt was made to sustain morale by a curbing of all criticism of the «war aims» of the government or its allies and by a carefully planned presentation and reïteration of the past and present criminal record of the opposing states. So powerful and all-embracing was this tidal wave of patriotic defense-reactions that it engulfed not only the «man on the street,» but even the most eminent scholars and publicists, some of whom in the past had seen great virtue in the cultural complex of the enemy. This disheartening spectacle doubtless reached its climax in the «manifesto» of the German professors, but in no state were the intellectual classes immune from the contagion of fervid patriotism, while those who maintained their poise were contemptously derided as «flabby highbrows» by their over-excited colleagues and critics. The astonishing effect of the wartime patriotism upon the public mind and its stimulating influence in creating a super-nationalism has been brilliantly and accurately set forth by Professor Hankins in the following citation: «Patriotism, like nationality, is not readily definable. It signifies loyalty to one's nation and implies the obligation to serve and defend it. It is thus a passion which all normal men feel, and which in time of our country's peril commands our instant loyalty. Of all the emotions that move men to action it is the most capacious. When it is aroused there is no other social force comparable to it in the completeness with which it dominates all other springs of action in all sorts and conditions of men. It lifts the average man up out of the concerns of a work-a-day world into the noblest spirit of devotion; it quickens the pulse of the sluggard, reforms the wayward, forces generosity from the stingy, arouses the plodder to dreams of heroic deeds, gives courage to the cowardly, and makes the hearts of the shrewd and crafty wolves of society swell with an ostensible love of country. In its face local feuds are forgotten; the bitter struggles of parties and classes are submerged; differences of creed, of social status, and even of race are obliterated. Under these circumstances only the group leaders may speak. The citizen must offer himself in silence as a willing sacrifice on the altar of his country in whatever manner those in authority may dictate. Even honest criticism is anathema; the conscientious objector, who in times of peace is praised as a courageous man who dares to stand against the world for what he believes right, is denounced as a sneaking coward and herded into prison. The individual rights of free speech, press, and assembly so essential to democratic government, so zealously guarded during peace, and so boastfully displayed to an admiring world on the national holidays, not only cease to exist but are even denounced and proscribed as inimical to the public safety. The noble sentiments of toleration are fiercely denounced, as is also individual variation from type which is vigorously defended during peace under the ideals of individual liberty and initiative. Every social institution is brought into line; all organs of public opinion send forth a constant stream of uniform suggestions; the appeal is made through church and lodge and every customary association, until the members of the social group coalesce into a solid sociality that surpasses the fondest imaginings of the utopian Socialist. It is not unnatural that such a titanic social force should stir men's emotional nature to its depths; and especially during war, for war hallows every cause. At such times patriotism, like a resistless and mysterious genius, fills the entire fabric of society with its magical power. Few individuals escape its enchantment, and almost no one dares brook its hostility. While it ennobles the soul with the sublime spirit of self-sacrifice, it compels men to dilute the honesty of their thoughts; makes cowards of all but the most stalwart souls by forcing them to substitute the worse for the better reason and the lower ideal for one they feel to be higher. Under its guise every sort of sinister human purpose thrives, for anything which can be made to appear patriotic is instantly and deeply approved. Any counsel of moderation is pounced upon as enemy propaganda, while the advocates of internationalism are accused of silly sentimentalism and treason. To encounter a suspicion of lack of patriotism creates a greater defilement than the violation of an ancient taboo. As in the days of witchcraft, suspects are whipped, tarred and feathered or hanged, or like the distinguished list in 'Who's Who in Pacifism and Radicalism' are immolated on the altar of militarism amid the shouts of the mob and the secret glee of the patriots who find the established social system the best of all possible systems. In other words, patriotism gives full sway to fear, unbridles the lusts and brutalities of savage man, intensifies our innate suggestibility, and subordinates the mind to every sort of delusion and deceit. Unfortunately there is no printed guide for the proper conduct of human affairs, and so deep is the mystery of social processes that only the ignorant and the simple have complete confidence in their solution of social problems. In times of stress therefore the social mind finds refuge in those torrents of instinctive emotion which arise from the deepest recesses of human nature and which propel the social group like a rudderless vessel before the ocean winds. Patriotism makes of national thought 'not a cerebration but a contagion, not an activity but an epidemic.'» When one reflects that it was in the midst of such a psychological setting that the Peace Conference had to carry on its work it need cause little surprise that many of the liberal and generous sentiments expressed by the allied leaders have vanished in thin air and that the result of their work bears very evident traces of revenge, a lust for spoil, and rampagious nationalism. These defects, together with the crop of newly emancipated nations, will furnish enough problems to tax the ingenuity of the statesmen of future generations.

VI. Nationalism and Internationalism.— While one cannot be blinded to the fact that the untold misery of the wars of the last four centuries has been caused primarily by unrestrained nationalism, dynastic, middle class and democratic, it would be equally futile to deny that the growth of national states has been a necessary step in the development of a permanent and peaceful adjustment of international relations. Expensive as the process has been, national wars seem to have been but the price paid in the wasteful natural economy of political evolution for the all-important growth of national and political aggregates which must always precede the ultimate alliance, federation, partnership or leaguing together of nations. Further, the very evils and excesses of national aggression have, in the past, forced upon the world's attention well-meant schemes for ending war and providing for peaceful methods of adjusting national claims. The destructive Thirty Years' War produced the proposals of Emeric Crucé (1623), Hugo Grotius (1625), and Sully (1638). The dynastic wars of Louis XIV stimulated the growth of international law and invited the pacific plans of William Penn (1693) and the Abbé de St.

Pierre (1712). The reaction against the Seven Years' War, as exemplified in the cosmopolitanism and rationalism of the latter 18th century, brought forth the discussions by Voltaire, Rousseau and Bentham. The French Revolutionary Wars stimulated Kant's proposal for a federation of republics, and the Napoleonic baptism of blood led to Alexander's theological proposition for the assurance of international peace and to Castlereagh's more practicable, if less noble, scheme for periodic European congresses of nations when questions should arise which threatened the peace of Europe. The «concert of powers,» which thus originated, proved unequal to coping with the aggressive nationalism of the last 40 years, the promising beginnings in international organization provided at the Hague Conferences proved ineffective, and it has required the most expensive and deadly war in human history to drive statesmen into even a half-hearted determination to take effective steps to prevent the recurrence of such a disaster in the future. When an adequate and workable international organization arises designed to curb aggressive and unscrupulous nationalism and to diminish the opportunities for future wars, the most complicated and perplexing problem in the history of political organization will have been solved and the authors of the enterprise will take their place on the level of the greatest statesmen of all time.

The history of modern Europe, however, from the passage of the «Statutes of Laborers» in the later 14th century to the present day is strewn with the wreckage of political attempts to resist, restrain or control great economic, social or psychological tendencies, forces and movements. A permanent and enduring partnership of nations must anticipate and forward economic fair dealing, social democracy and cultural assimilation. An abiding and effective international organization has to-day a much better prospect of success than ever before in human history, not only because it has as a psychological stimulus the fresh memory of the horrors of the most frightful military cataclysm in the record of human development, but also because there now exists for the first time in such a crisis a real physical, economic and intellectual internationalism which can serve as the foundation for an international political organization. Paradoxical as it may seem, that same Industrial Revolution which, in its immediate effects, greatly forwarded national development at home and imperialism abroad, also laid the basis for a practical internationalism. The growth of world trade and financial and commercial interdependence have furnished a set of economic motives for pacific adjustments, while the improvement of means of transportation and the communication of intelligence, and the internationalization of science and culture have prepared the way for that growth of intellectual unity and harmony and that development of likemindedness and sympathy which Professor Tenney rightly regards as the all-essential antecedents of any enduring and effectual world organization. But it would, nevertheless, be futile to hope that mankind is far enough advanced in its development to trust merely to the natural course of political evolution for the speedy attainment of world order and permanent peace. Only by the exercise of the utmost thoughtfulness, candor, tolerance and conciliation will it be possible to bring into existence an international spirit and political organization which will possess any assurance of terminating physical conflict among nations. Exuberant nationalism, political and economic, will have to be curbed before international order can exist. Mr. Morrow has well presented the political adjustment which must be made between nationalism and internationalism; «We must not, however, deceive ourselves. It is most important clearly to recognize that we are trying to get two things. If we want world peace at whatever price, we can take our eyes away from liberty and think only of order, and the principle of nationality will go by the board. If we want unrestricted liberty at whatever cost, we can think only of the separate national states and the price will be the abandonment of a League of Nations. The reconciliation of these two aims — world order and individual liberty — is the problem of the Peace Conference. We must go at our task with open eyes. We must start by admitting that we cannot get something for nothing, that if national states are vital to the orderly development of the world, we must sacrifice some world order for the sake of the development of national characteristics; that if world order is so vitally essential that we must have it, then we must sacrifice some of the power and rights of national states in order to insure a greater measure of world order. This is the reconciliation which the Peace Conference must try to make.» Political relations have, however, tended normally to be but the reflection of the deeper economic conditions and forces, and, just as economic unity has always proved the most effective impulse towards political harmony, so economic separatism and suspicion will threaten the dissolution of any political entity. Therefore, it seems clear that any permanent and effective international political or juridical organization must rest upon a basis of economic trust and fair dealing. This phase of the problem has been forcibly set forth by Professor Hankins: «The great stumbling block to internationalism is today the outworn tradition of Mercantilism. This familiar doctrine holds that the nation is the trading unit, that consequently it profits most when it sells much and buys little, and that consequently each nation ought to shut itself up behind trade barriers and, like a hermit empire, prevent the intrusion of the cheap goods of other nations. With the overthrow of the dynastic state nothing now seems to have so firm a hold in popular tradition and hence so close a connection to the galvanic batteries of patriotism as this hoary tradition. . . . If we are to have a lasting peace, then this illusion must also pass into the limbo of outworn creeds; and the peoples of the earth, freed from local fears under the protecting security of a superstate, can become rivals in exploiting the earth rather than each other and mutually enrich each other by a free exchange of their products. Far more certain than the proposed super-alliance of nations as a guarantee of future peace as well as prosperity among men would be a Zollverein of all industrial nations. Likewise the most prolific source of international jealousy and suspicion in the future seems likely to be trade discriminations, differential tariffs, unfair control and distribution of raw materials and shipping facilities, and other efforts to maintain the economically self-sufficient national state. The immediate problem is the formation of a League of Nations as the means of allaying fear. The problem of the future is the removal of trade barriers and the establishment of an international economic organization of the world. Only thus will the superrational sanction of nationalistic patriotism be transmuted into a supreme loyalty to humanity." When these necessary cultural, political and economic prerequisites of a permanent peace have been secured, and then only, can one hope for a just and effective world order, for, as Professor Giddings has well said: "A league to enforce peace must be composed of nations that will both keep faith with one another and practically act in co-operation with one another against the law-breaker. Practically these requirements can only be met, and will be met, only if the component nations of the league share a common civilization and hold a common attitude towards questions of right, liberty, law and polity."

Bibliography. I. Definition and Analysis of Nationalism.— Bryce, J., 'Essays and Addresses in Wartime' (Chap. VII); Dalberg-Acton, J. E. D., 'History of Freedom'; Garner, J. W., 'Introduction to Political Science' (Chap. II); Giddings, F. H., 'The Responsible State'; Hankins, F. H., 'Patriotism and Peace'; Krehbiel, E. B., 'Nationalism, War and Society' (Parts I–II); Lieber, F., 'Fragments on Nationalism and Internationalism'; Matthews, S., 'Religion and Patriotism'; Muir, R., 'Nationalism and Internationalism' (pp. 37–57); Perla, L., 'What is National Honor'; Robinson, J. H., 'What is National Spirit?' (*Century Magazine*, 1916); Rose, J. H., 'Nationality in Modern History' (Lecture VIII); Russell, Bertrand, 'Why Men Fight'; Ruyssen, T., 'The Principle of Nationality' (*Publications of American Association for International Conciliation*, 1916–17); Seton-Watson, R. W., et al., 'The War and Democracy' (Chaps. I–II); Trotter, W., 'The Instinct of the Herd in Peace and War'; Zangwill, I., 'The Principle of Nationalities.'

II. Nationalism Before the Commercial Revolution. 1. *Tribal Society.*— Boas, F., 'The Mind of Primitive Man' (Chaps. IV, VIII); Chapin, F. S., 'An Introduction to Social Evolution' (Part II); Durkheim, E., 'The Elementary Forms of Religious Life'; Giddings, F. H., 'Principles of Sociology' (Book III); Goldenweiser, A. A., 'The Social Organization of the Indians of North America' (in *Journal of American Folklore*, 1914); 'Totemism, an Analytical Study'; Hobhouse, L. T., 'The Material Culture and the Social Institutions of the Simpler Peoples'; Lowie, R. H., 'Social Organization' (in *American Journal of Sociology*, 1914); Marett, R. R., 'Anthropology'; Marvin, F. S., 'The Living Past' (Chap. II); Oppenheimer, F., 'The State' (Chap. II); Rivers, W. H. R., 'The Todas'; 'Kinship and Social Organization'; 'History of Melanesian Society'; Roscoe, J., 'The Baganda'; Smith, W. R., 'The Religion of the Semites'; Sumner, W. G., 'Folkways'; 'War and Other Essays' (Chap. I); Tylor, E. B., 'Anthropology'; Wissler, C., 'The American Indian.'

2. *The Ancient City-State.*— Botsford, G. W., 'Hellenic Civilization'; 'Hellenic History'; Bury, J. B., 'A History of Greece'; Coulanges, Fustel de, 'The Ancient City'; Farnell, L. R., 'Cults of the Greek States'; Fowler, W., 'The City-State of the Greeks and Romans'; Friedländer, L., 'Town Life in Ancient Italy'; Grant, A. J., 'Greece in the Age of Pericles'; Harrison, J. E., 'Ancient Art and Ritual'; 'Primitive Athens'; 'Prolegomena to the Study of Greek Religion'; 'Themis'; Hawes, H. B., 'Crete, the Forerunner of Greece'; Keller, A. G., 'Homeric Society'; King, L. W., 'A History of Sumer and Akkad'; Lang, A., 'Homer and his Age'; 'The World of Homer'; Mahaffy, J. P., 'Social Life in Greece'; 'A Survey of Greek Civilization'; Marvin, F. S., 'The Living Past' (Chap. IV); Myres, J. L., 'The Dawn of History'; Ridgeway, W., 'The Earliest Age of Greece'; Seignobos, C., 'Ancient Civilization' (Chaps. VIII–XIX); Seymour, T. D., 'The Homeric Age'; Zimmern, A., 'The Greek Commonwealth.'

3. *The Ancient Patriarchal Empires.*—Arnold, E. V., 'Roman Provincial Administration'; Breasted, J. H., 'A History of Egypt'; 'A History of the Ancient Egyptians'; 'The Development of Religion and Thought in Ancient Egypt'; Bryce, J., 'The Roman and British Empires'; Bury, J. B., 'A History of the Later Roman Empire'; (ed.) 'The Cambridge Mediæval History' (Vol. I); Dill, S., 'Roman Society from Nero to Marcus Aurelius'; 'Roman Society in the Last Century of the Western Empire'; Erman, A., 'Life in Ancient Egypt'; Ferrero, G., 'The Greatness and Decline of Rome'; Fowler, W., 'Rome'; 'Social Life at Rome in the Age of Cicero'; 'The Religious Experience of the Roman People'; Frank, T., 'Roman Imperialism'; Goodspeed, G. S., 'A History of the Babylonians and Assyrians'; Hall, H. R., 'The Ancient History of the Near East'; Hayes, C. J. H., 'An Introduction to the Sources Relating to the Germanic Invasions'; Hogarth, D. G., 'The Ancient East'; Holm, A., 'A History of Greece' (Vols. III–IV); Jastrow, M., 'The Civilization of Babylonia and Assyria'; King, L. W., 'A History of Babylonia'; Mahaffy, J. P., 'Alexander's Empire'; Marvin, F. S., 'The Living Past' (Chaps. III, V); Maspero, G. C. C., 'Life in Ancient Egypt and Assyria'; 'The Dawn of Civilization'; 'The Struggle of the Nations'; 'The Passing of the Empires'; Meyer, E., 'Geschichte des Altertums'; Mommsen, T., 'History of Rome'; 'Provinces of the Roman Empire'; Pelham, H. F., 'Outlines of Roman History'; Petrie, F., 'A History of Egypt'; Reid, J. S., 'The Municipalities of the Roman Empire'; Robinson, J. H., 'The New History' (Chap. VI); Rogers, R. W., 'A History of Babylonia and Assyria'; Sayce, A. H., 'Babylonians and Assyrians'; 'Social Life among the Assyrians and Babylonians'; Schiller, H., 'Geschichte der römischen Kaiserzeit'; Seignobos, C., 'Ancient Civilization' (Chaps. III–VII, XX–XXVII).

4. *The Middle Ages.*— Adams, G. B., 'Civilization During the Middle Ages'; 'Political History of England'; Bémont and Monod,

‘Mediæval Europe’; Bryce, J., ‘The Holy Roman Empire’; Bury, Gwatkin and Whitney (eds.), ‘The Cambridge Mediæval History’; Cross, A. L., ‘A History of England and Greater Britain’ (Chaps. I–XVII); Cunningham, W., ‘Western Civilization in its Economic Aspects’ (Vol. II); Davis, H. W. C., ‘Mediæval Europe’; ‘England under the Normans and Angevins’; Eichmann, E., ‘Kirche und Staat’; Emerton, E., ‘Introduction to the Middle Ages’; ‘Mediæval Europe’; ‘The Beginnings of Modern Times’; Fisher, H. A. L., ‘The Mediæval Empire’; Flick A. C., ‘The Rise of the Mediæval Church’; Giesebrecht, W., ‘Die Deutsche Kaiserzeit’; Giry and Réville, ‘The Emancipation of the Mediæval Towns’; Green, A. S., ‘Town Life in the Fifteenth Century’; Green, J. R., ‘A Short History of the English People’; Gregorovius, F., ‘A History of the City of Rome in the Middle Ages’; Hahn, L., ‘Das Kaisertum’; Henderson, E. F., ‘A History of Mediæval Germany’; Hodgkin, T., ‘Italy and Her Invaders’; Lavisse, E. (ed.), ‘Histoire de France’; Lavisse and Rambaud (eds.), ‘Histoire Genérale’; Luchaire, A., ‘Manuel des institutions françaises’; ‘Histoire des institutions monarchiques de la France’; McKechnie, W. S., ‘The Magna Carta’; Masson, G., ‘The History of Mediæval France’; Munro, D. C., ‘A History of the Middle Ages’; Munro and Sellery, ‘Mediæval Civilization’; Oman, C., ‘The Dark Ages’; ‘England Before the Norman Conquest’; Paetow, L. J., ‘A Guide to the Study of Mediæval History’; Robinson, J. H., ‘A History of Western Europe’; Round, J. H., ‘Feudal England’; Seignobos, C., ‘The Feudal Régime’; ‘Mediæval and Modern Civilization’ (Chaps. I–XV); Shotwell, J. T., ‘The Middle Ages’ (in *Encyclopedia Britannica,* 11th ed.); Thorndike, L., ‘A History of Mediæval Europe’; Tout, T. F., ‘The Empire and the Papacy’; Vickers, K., ‘England in the Later Middle Ages’; Vinogradoff, P., ‘Roman Law in Mediæval Europe.’

III. The Commercial Revolution and the Rise of the Modern Dynastic National State. —Abbott, W. C., ‘The Expansion of Europe’; Chéruel, P. A., ‘Histoire de France sous la ministère de Mazarin’; ‘L’Histoire de l’administration monarchique en France’; Cheyney, E. P., ‘The European Background of American History’; Cunningham, W., ‘Western Civilization in its Economic Aspects’ (Vol. II, Book V); ‘The Growth of English Industry and Commerce’ (Vol. I, Book V); Dalberg-Acton, Leathes, Prothero and Ward (eds.), ‘The Cambridge Modern History’; Day, C., ‘A History of Commerce’ (Part III); Droysen, J. G., ‘Geschichte der preussischen Politik’; Faguet, E., ‘An Introduction to Literature’; Fisher, H. A. L., ‘Political History of England, 1485–1547’; Fletcher, C. R. L., ‘Gustavus Adolphus’; Froude, J. A., ‘History of England from the Death of Wolsey to the Defeat of the Spanish Armada’; Gairdner, J., ‘Henry VII’; Gardiner, S. R., ‘History of England, 1603–42’; ‘The History of the Commonwealth and the Protectorate’; ‘The Thirty Years’ War’; Gindley, A., ‘A History of the Thirty Years’ War’; Green, J. R., ‘A Short History of the English People’ (Chaps. VI–VIII); Hanotaux, G., ‘Origine de l’institution des intendants’; Hassall, A., ‘The Balance of Power’; Hayes, C. J. H., ‘Political and Social History of Modern Europe’ (Vol. I); Henderson, E. F., ‘A Short History of Germany’ (Vol. I); Hume, M., ‘Spain, its Greatness and Decay’; Innes, A. D., ‘England under the Tudors’; ‘Ten Tudor Statesmen’; Jamison, E. (et al.), ‘A History of Italy’; Johnson, A. H., ‘Europe in the 16th Century’; Kluchvesky, V. O., ‘A History of Russia’; Lavisse, E. (ed.), ‘Histoire de France’ (Vols. VII f); Lewinski-Corwin, E. H., ‘The Political History of Poland’; Leadam, J. S., ‘Political History of England, 1702–1760’; Leger, L., ‘A History of Austria-Hungary’; Lodge, R., ‘Political History of England, 1660–1702’; Marriott and Robertson, ‘The Evolution of Prussia’; Montague, F. C., ‘Political History of England, 1603–1660’; Muir, R., ‘The Expansion of Europe’ (Chaps. I–IV); Perkins, J. B., ‘France under Richelieu and Mazarin’; ‘France under the Regency’; ‘France under Louis XV’; Phillips, W. A., ‘Poland’; Pollard, A. F., ‘Factors in Modern History’; ‘Henry VIII’; ‘History of England from the Accession of Edward VI to the Death of Elizabeth’; Rambaud, A., ‘History of Russia’; Ranke, L., ‘A History of Prussia’; Ritter, M., ‘Deutsche Geschichte in Zeitalter der Gegenreformation und des Dreissigjährigen Krieges’; Robertson, C. G., ‘England under the Hanoverians’; Robinson and Beard, ‘Development of Modern Europe’ (Vol. I); Robinson, J. H., ‘The Reformation’ (in *Encyclopedia Britannica,* 11th ed.); Seebohm, F., ‘The Era of the Protestant Reformation’; Seignobos, C., ‘Mediæval and Modern Civilization’ (Chaps. XVI–XXVI); Stefansson, J., ‘Denmark and Sweden’; Tilley, A. A., ‘The Literature of the French Renaissance’; Trevelyan, G. M., ‘England under the Stuarts’; Tuttle, H., ‘History of Prussia’; Wakeman, H. O., ‘The Ascendancy of France’; Ward and Waller (eds.), ‘Cambridge History of English Literature.’

IV. The French Revolution, the Napoleonic Period, and the Popularization of National Sentiment in Europe.— Aulard, A., ‘Political History of the French Revolution’; Bourne, H. E., ‘The Revolutionary Period in Europe’; Dalberg-Acton (et al.), ‘The Cambridge Modern History’ (Vols. VIII–IX); Denis, E., ‘L’Allemagne, 1789–1810’; Fisher, H. A. L., ‘Napoleon’; ‘Studies in Napoleonic Statesmanship’; Fournier, A., ‘Napoleon I’; Haüsser, L., ‘Deutsche Geschichte, 1785–1815’; Hayes, C. J. H., ‘A Political and Social History of Modern Europe’ (Vol. I, Part III); Hume, M., ‘Modern Spain’ (Chaps. I–IV); Johnston, R. M., ‘The French Revolution’; ‘Napoleon’; ‘The Napoleonic Empire in Southern Italy’; Madelin, L., ‘The French Revolution’; Matthews, S., ‘The French Revolution’; Oman, C., ‘History of the Peninsular War’; Oncken, W., ‘Das Zeitalter der Revolution’; Paxson, F. L., ‘The Independence of the South American Republics’; Phillips, W. A., ‘The Confederation of Europe’; Rose, J. H., ‘Nationality in Modern History’ (Lectures II–IV); ‘The Revolutionary and Napoleonic Era’; ‘The Life of Napoleon I’; Seeley, J. R., ‘The Life and Times of Stein’; Seignobos, C., ‘A History of Contemporary Civilization’ (Chaps. I–VIII); Sorel, A., ‘L’Europe et la révolution française’; Stern, A., ‘Geschichte Europas’ (Vol. I); Sybel, H., ‘Geschichte der

Revolutionzeit von 1789’; Thayer, W. R., ‘The Dawn of Italian Independence’ (Vol. I); Treitschke, H., ‘History of Germany in the Nineteenth Century’ (Vol. 1).

V. The Industrial Revolution, National Imperialism and the Latest Stage in the Evolution of Nationalism.—Andrews, C. M., ‘The Historical Development of Modern Europe’; Ashley, P., ‘Modern Tariff History’; Bassett, J. S., ‘A Short History of the United States’; Becker, Johnson, Dodd and Paxon, ‘The Riverside History of the United States’; Blakeslee, G. H. (ed.), ‘Japan and Japanese-American Relations’; ‘Recent Developments in China’; ‘Latin America’; ‘The Problems and Lessons of the War’; Bogart, E. L., ‘Economic History of the United States’; Bracq, J. C., ‘France under the Third Republic’; Brinkley, F., ‘A History of the Japanese People’; Coman, K., ‘The Industrial History of the United States’; Dawson, W. H., ‘The Evolution of Modern Germany’; Debidour, A., ‘Histoire diplomatique de l’Europe’: Denis, E., ‘La Bohème depuis la Montagne-Blanche’; Dewey, J., ‘German Philosophy and Politics’; Dickinson, G. L., ‘The European Anarchy’; Dimnet, E., ‘France herself Again’; Dominian, L., ‘The Frontiers of Language and Nationality in Europe’; Douglass, R. K., ‘Europe and the Far East’; Farrand, M., ‘The Development of the United States’; Fife, R. H., ‘The German Empire Between Two Wars’; Fish, C. R., ‘The Development of American Nationality’; ‘American Diplomacy’; Gibbins, H. D. B., ‘Industry in England’; Gibbons, H. A., ‘The New Map of Europe’; ‘The New Map of Africa’; ‘The Reconstruction of Poland and the Near East’; Gooch, G. P., ‘History and Historians in the Nineteenth Century’; Guilland, A., ‘Modern Germany and Her Historians’; Hanotaux, G., ‘Contemporary France’; Harris, N. D., ‘Intervention and Colonization in Africa’; Hart, A. B. (ed.), ‘The American Nation: a History’; Hayes, C. J. H., ‘A Political and Social History of Modern Europe’ (Vol. II); Hazen, C. D., ‘Europe Since 1815’; Headlam, J. W., ‘Bismarck and the Founding of the German Empire’; Henderson, E. F., ‘A Short History of Germany’ (Vol. II); Hirst, F. W. (ed.), ‘Porter’s Progress of the Nation’; Hobhouse, L. T., ‘Democracy and Reaction’; Hobson, J. A., ‘The Evolution of Modern Capitalism’; ‘Imperialism’; Hornbeck, S. K., ‘Contemporary Politics in the Far East’; Howard, E. D., ‘Recent Industrial Progress in Germany’; Johnston, H. H., ‘A History of the Colonization of Africa’; ‘Common-Sense in Foreign Policy’; Keller, A. G., ‘Colonization’; Keltie, J. S., ‘The Partition of Africa’; King, B., ‘A History of Italian Unity’; King and Okey, ‘Italy To-Day’; La Gorce, P., ‘Histoire du second empire’; Latourette, K., ‘The Development of China’; ‘The Development of Japan’; Leroy-Beaulieu, P., ‘De la colonisation chez les peuples modernes’; Lavasseur, E., ‘Histoire des classes ouvrières et de la industrie en France de 1789 à 1870’; Mantoux, P., ‘La révolution industrielle en Angleterre’; Mariott, J. A. R., ‘England Since Waterloo’; ‘The Eastern Question’; Maurice, C. E., ‘The Story of Bohemia’; Mavor, J., ‘An Economic History of Russia’; McLaren, W. W., ‘A Political History of Japan’; McMaster, J. B., ‘A History of the People of the United States’; Miller, W., ‘The Ottoman Empire’; Moore, J. B., ‘Principles of American Diplomacy’; Morel, E. D., ‘Ten Years of Secret Diplomacy’; Murdock, J., ‘A History of Japan’; Nippold, O., ‘German Chauvinism’; Oberholtzer, E. P., ‘A History of the United States since the Civil War’; Ogg, F. A., ‘The Economic Development of Modern Europe’; ‘The Governments of Europe’; Osgood, H. L., ‘The English Colonies in the Seventeenth and Eighteenth Centuries’; Reinsch, P., ‘World Politics at the End of the Nineteenth Century’; Rhodes, J. F., ‘A History of the United States from the Compromise of 1850’; Robinson and Beard, ‘The Development of Modern Europe’ (Vol. II); Rose, J. H., ‘Nationality in Modern History’ (Lectures V–IX); ‘The Development of the European Nations’; Schapiro, J. S., ‘Modern and Contemporary European History’; Schlesinger, A. M., ‘The Colonial Merchants and the American Revolution’; Schmitt, B. E., ‘England and Germany, 1740–1914’; Scott, J. F., ‘Patriots in the Making’; Seton-Watson, R. W., ‘The War and Democracy’; ‘Racial Problems in Hungary’; ‘The Southern Slav Question’; ‘The Rise of Nationality in the Balkans’; Seymour, C., ‘The Diplomatic Background of the War’; Seignobos, C., ‘History of Contemporary Civilization’ (Chaps. IX–XX); ‘A Political History of Modern Europe’; Shepherd, W. R., ‘Latin America’; Schuster, W. M., ‘The Strangling of Persia’; Slater, G., ‘The Making of Modern England; Skrine, F. H., ‘The Expansion of Russia’; Sybel, H., ‘The Founding of the German Empire’; Sykes, P. M., ‘A History of Persia’; Taylor, A. H. E., ‘The Future of the Southern Slavs’; Thayer, W. R., ‘The Life and Times of Cavour’; Toynbee, A. J., ‘Nationality and the War’; Turner, F. J., ‘The Rise of the New West’; Veblen, T., ‘Imperial Germany and the Industrial Revolution’; Ward, A. W., ‘Germany Since 1815’; Zimmermann, A., ‘Die europäischen Kolonien’; ‘Geschichte der deutscher Kolonialpolitik.’

VI. Nationalism and Internationalism.—Addams, J., ‘Newer Ideals of Peace’; American Association for International Concilliation, Bulletins 113, 131, 134, 135; Balch, T. W., ‘The Nouveau Cynée of Emeric Crucé’; Bassett, J. S., ‘The Lost Fruits of Waterloo’; Bentham, Jeremy, ‘A Plan for an Universal and Perpetual Peace’; Bolce, H., ‘The New Internationalism’; Bourne, R., ‘Towards an Enduring Peace’; Brailsford, H. N., ‘A League of Nations’; Butler, N. M., ‘The International Mind’; Darby, W. E., ‘International Tribunals’; Dickinson, G. L., ‘The Choice Before Us’; Duggan, S. (ed.), ‘The League of Nations’; Faries, J. C., ‘The Rise of Internationalism’; Fried, A. A., ‘The Restoration of Europe’; Goldsmith, R., ‘The League to Enforce Peace’; Hobson, J. A., ‘Towards International Government’; Howe, F. C., ‘The Only Possible Peace’; Hull, W. J., ‘The Two Hague Conferences’; Kallen, H. M., ‘The League of Nations, To-Day and To-Morrow’; Kant, Immanuel, ‘The Idea of a Universal History’; ‘Eternal Peace’ (translated by Hastie); Krehbiel, E. B., ‘Nationalism, War and Society’ (Part III); Lane, R. N. A. (Norman Angell), ‘The Great Illusion’; ‘The Political Conditions of Allied Success’; Marburg, T., ‘A League of Nations’; Mead, E. D. (ed.), ‘The Great Design of Henry IV'; Morrow, D. W., 'A Society of Free States'; Minor, R. C., 'A Republic of Nations'; Muir, R., 'Nationalism and Internationalism'; Ogg and Beard, 'National Governments and the World War' (Part IV); Penn, William, 'A Plan for the Peace of Europe'; Phelps, E. M. (ed.), 'Selected Articles on a League of Nations'; Phillips, W. A., 'The Confederation of Europe'; Reinsch, P. S., 'Public International Unions'; Rose, J. H., 'Nationality in Modern History' (Lecture X); Saint-Pierre, C. I. C., 'A Project for Settling an Everlasting Peace in Europe'; Sayre, F. B., 'Experiments in International Administration'; Scott, J. B., 'An Essay on a Congress of Nations by William Ladd' (especially the introduction); Tenney, A. A., 'Theories of Social Organization and the Problem of International Peace' (in *Political Science Quarterly*, 1915); Veblen, T., 'An Inquiry into the Nature of Peace and the Terms of Its Perpetuation'; Woolf, L. S., 'International Government.'

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NATIONALIST, in British politics, a term applied to the Irish political party whose program includes a partial separation of Ireland from Great Britain. The party was organized by Isaac Butt, and after his death was ably led by Charles Stuart Parnell. After the death of the latter it was split into factions but was re-united in 1899 under the leadership of John E. Redmond. Its principal services to the Irish nation have been the settlement of the land troubles and the establishment of institutions for the higher education of Catholics. The party, however, failed to keep in touch with the younger generation in Ireland; more and more it came to resemble the great parties of England; only men who pledged docility to its leaders received its support at elections. The cleavage between people and party became apparent soon after the outbreak of the war in 1914, and after the revolt in 1916 the support of the masses was withdrawn altogether. At the various by-elections since held throughout the country the party's candidates have been defeated by the Sinn Fein candidates. Its power is gone, and a general election would see it disappear forever. The reasons are not far to seek; as a party it has outlived its usefulness; it is no longer truly representative of the people; new men and new principles clamor for recognition and will not be denied.

NATIONALITY. Nationality is both an ethnic and a legal term. As an ethnological concept it has reference to the racial status of an individual or group. Thus we speak of an individual possessing German, Polish, Italian or Greek nationality, without regard to his citizenship, for the terms citizenship and nationality are not synonymous. In general, people who have a common ethnic origin, who speak the same language and who have a common literature belong to the same nationality although they may be citizens or subjects of different states. Thus we find large numbers of persons of Polish nationality in Germany, Austria, Russia and other states; Germans in large numbers are found not only in Germany, but in Austria, Switzerland and other countries; persons of Jewish nationality are widely scattered over the world and are citizens or subjects of many states. States and nations are, therefore, by no means identical; some states, like Austria, Hungary, Russia and Switzerland, embrace within their territorial limits various nationalities. On the other hand a nation may extend beyond the limits of a single state. Thus the French nation embraces practically the whole of the French Republic and the larger part of Belgium. The Germanic nation extends beyond the limits of the German empire into Austria and Switzerland. The tendency of modern times is in the direction of identification of states and nations, that is, toward the organization of states with boundary lines which coincide with those of nations, this on the principle that the bringing of peoples having a common ethnic origin and language under the same state organization conduces to national unity and stability. The organization of the German and Italian states along national lines during the last century was in accord with this tendency. Disregard of this principle, as for example, by the Vienna Congress in 1815 which undertook to reorganize the states of Europe without regard to considerations of nationality, has led to unfortunate results. Experience teaches that ethnic homogeneity is one of the most powerful sources of political strength and writers are not lacking who maintain that everywhere the boundaries of states and nations should be coterminous, that is, every nation should be organized into a separate and distinct state and that no state should embrace within its territorial limits more than one nation or nationality. In accordance with this theory the Polish nation which was until recently embraced within the limits of three different states has been brought under a single state organization; the Danish, French and Polish parts of Germany have been detached and united to the states to which ethnically they properly belong or organized into new states; the Italian portions of Austria have been united to the Italian state and so on.

As a term of municipal and international law nationality has reference to the status of an individual as a member of a particular state. In this sense the term is synonymous with citizenship (see CITIZENSHIP AND EDUCATION) though not invariably, for an individual may for certain purposes be a «national» of a particular state without being a citizen or subject in the full sense of the term. The term may also have reference to the national status of a ship or cargo. Thus the liability of a ship or cargo to capture during war depends upon its nationality just as the right of an individual to the protection of a particular government or his liability to military service depends upon his nationality.

The nationality of an individual is determined by municipal or state law while that of a ship or cargo is regulated for the most part by the rules of international law. As a consequence of the former principle it may and does frequently happen that two or more states lay claim to the allegiance of the same person. In that case the individual possesses a double nationality. Likewise it may happen that an individual is without any nationality at all, that is, he is *staatlos* or *heimatlos*, as the Germans say. Cases of dual nationality arise from the existence of two conflicting systems for determining nationality. These two systems are known as the *jus soli* and the *jus sanguinis.* According to the former rule nationality is primarily determined by the place of birth; according to the latter, by the nationality of the parents. The *jus soli* rule grew up in Europe during the feudal period and in time it became the general law on the subject on the continent of Europe. In the later Middle Ages, however, it was largely superseded by the *jus sanguinis* rule which originated in the Roman law. According to the strict principle of the *jus soli* all persons born within the jurisdiction of a particular state, regardless of whether the parents be citizens or aliens, are deemed to be citizens of that state. Likewise all children born abroad, even though their parents be citizens, are regarded as aliens. On the other hand, according to the strict principle of the *jus sanguinis* all persons born within the jurisdiction of a particular state, of parents who are aliens, are themselves aliens, while those born abroad of citizen parents take the nationality of their parents (or rather that of the father, in case of legitimate children, and that of the mother, in case of illegitimate children).

The *jus soli* principle is the basis of the law of Great Britain and the United States; the *jus sanguinis* rule prevails in Germany, Austria, France, Hungary, Switzerland and other states. Few states, however, apply either principle exclusively. Thus according to American law children born abroad of fathers who are citizens of the United States and who have themselves resided here are deemed to be citizens of the United States. Likewise, according to British law, children born abroad of British subjects are treated as natural-born British subjects. Thus both countries, although following in general the doctrine of the *jus soli,* have adopted the *jus sanguinis* principle for determining the status of children born abroad of citizen parents. In many other states a mixed system prevails. Thus according to French law while all children born of French parents anywhere in the world are deemed to be French citizens, those born in France of alien parents and not domiciled in France at the age of their majority are regarded as foreigners. A child, therefore, born in the United States of French parents would be a citizen of the United States *jure soli,* but a citizen of France *jure sanguinis.* We have here a case of double nationality, due to the existence of conflicting rules by which citizenship is determined. In practice the consequences of such conflicts are usually avoided by the policy of states in refraining from asserting their claims in such cases so long as the person whose nationality is in dispute remains outside their jurisdiction. To avoid cases of double nationality it would be necessary to assimilate all the various systems for determining national character, an ideal which, however desirable, is not likely to be realized.

In time of war the national character of an individual may not be the same as that of his political character. It may be that of his domicile or his place of business. Thus if he is domiciled in an enemy country or has a house of trade therein he may for certain purposes be an alien enemy to his own country.

Concerning the test for determining the nationality of ships in time of war there has been much diversity of opinion. The continental European view has generally been that national character in such cases should be determined by the nationality of the owner; English and American opinion, however, has regarded the flag which the ship is entitled to fly as the proper test. The question was considered at the London Naval Conference of 1908–09, and a compromise was reached by the adoption of the rule that the nationality of a vessel should be determined by the flag which it is entitled to fly (article 57) and that the enemy or neutral character of goods found on board an enemy vessel should be determined by the neutral or enemy character of the owner (article 58). During the recent World War, however, the British government rejected the former rule and put into effect the rule that the neutral or enemy character of a vessel should be determined by the nationality of the owner. See also ALLEGIANCE and CITIZENSHIP IN THE UNITED STATES. For bibliography see article CITIZENSHIP IN THE UNITED STATES.

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NATIONS, Battle of the («Völkerschlacht»), in the Napoleonic wars, the battle fought at Leipzig, 16–19 Oct. 1813, in which Napoleon, with about 190,000 men, was defeated by the Allies numbering from 200,000 to over 300,000 at different stages of the conflict. The French loss is estimated at 40,000 killed and wounded, and 30,000 prisoners; that of the Allies at 45,000 killed and wounded. The liberation of Germany is practically dated from this event. See NAPOLEON I.

NATIONS, Law of. See INTERNATIONAL LAW.

NATIONS, League of. See WAR, EUROPEAN: PEACE TREATIES.

NATIVE BEAR, the Australian koala (q.v.).

NATIVE COMPANION, an Australian name for a large local crane (*Grus australasianus*) peculiar to that island-continent.

NATIVISM, that theory which bases some tangible part or phase of our knowledge on the inborn nature of mind and not on sense-experience alone. It is opposed to empiricism (q.v.), which finds in sense-experience the origin of all knowledge. While the distinction between truths of reason and truths of sense dates from Heraclitus, or even earlier, Plato was the first to make nativism a leading tenet of his philosophy. Over against the knowledge of sense, he maintained the existence of a knowledge of ideas due to a recollection, stimulated indeed by sensory experience, but reaching back beyond birth. Aristotle's views as to the origin of knowledge, though not greatly emphasized, seem to be essentially of the same nature as those of Plato. The Stoics were the first to use the word *innatus* or truths, applying it primarily to the moral law. The realists of the Middle Ages, holding as they did that universals have a separate existence, were practically driven to nativism, unlike the nominalists, who maintained that nothing is in the intellect which was not previously in sense. In modern times nativism and rationalism have gone hand in hand, and Descartes, Spinoza and especially

Leibniz believed in the existence of innate ideas, such as those of God and of the self. Locke opposed this opinion, and pointed out that the new-born child does not possess a ready-made stock of ideas. Kant maintained a theory of knowledge essentially nativistic, but departed from his predecessors in not making knowledge consist in the possession of representative ideas and in holding that the phase of knowledge independent of sense — the knowledge of pure form — is not so much congenital as extra-temporal. The modern discussion of evolutionism has given a new turn to nativism, in that some writers, such as Spencer, have upheld the view that the knowledge of the individual is in a large measure inherited racial experience. However, according to Weismann's theory of evolution, acquired characterictics cannot be inherited, so that racial experience can have no direct effect on the individual. The innate substratum of the mind, on this theory, is the result of the accumulation of fortuitous variations which have been able to survive through special fitness. Neither this view nor Spencerianism are in the original sense forms of nativism, since the sort of innate knowledge which the classical nativism maintains is the same in nature for all minds.

It is not essential for nativism to maintain that the new-born babe actually has certain conceptions perfectly formed, or that he will form them without any sensory stimulus. An item of knowledge may be innate even if it requires experience to evoke it. For this reason Locke's refutation of Leibniz will not hold water. On the other hand, to be an antithesis to empiricism, the nativist must maintain, not merely that the general nature of man is a condition of all sensory experience, for the empiricist would agree with him in this, but that some phase of knowledge, such as that of necessary truths, is peculiarly dependent on the nature of thinking minds themselves. Consult Aristotle, ‹De Anima›; Locke, ‹Essay on the Human Understanding›; Kant, ‹Kritik der reinen Vernunft›; Leibniz, ‹New Essays›; Locke, ‹Essays on the Human Understanding›; Mill, J. S., ‹A System of Logic› (London 1843); Moore, G. E., article on ‹Nativism and Empiricism› in ‹Baldwin's Dictionary of Philosophy and Psychology› (new ed., New York 1911); Plato, ‹Meno›; ‹Phaedo›; ‹Theaetetus›; Zeller, ‹Stoics, Epicureans and Sceptics› (tr. London 1892).

NATIVITY, *in astrology,* the theme or figure of the heavens, and particularly of the 12 houses, at the moment when a person is born, supposed to indicate his future destinies, and synonymous with horoscope. See HOROSCOPE; ASTROLOGY.

NATORP, nä'tôrp, **Paul Gerhard,** German scholar: b. Düsseldorf, Germany, 24 Jan. 1854. He was educated in Berlin, Bonn and Strassburg and accepted a professorship in Marburg in 1885. He wrote ‹Descartes' Erkenntnisstheorie› (1882); ‹Platos Staat› (1895); ‹Platos Ideenlehre› (1903); ‹Socialpädogigik› (3d ed. 1909); ‹J. H. Pestalozzi› (2d ed., 1910); ‹Die logischen Grundlagen der exakten Wissenschaften› (1910); ‹Philosophie: ihr Problem und ihre Probleme› (1911); ‹Hoffnungen und Gefahren unserer Jugendbewegung› (1914).

NATROLITE (from «natron,» native carbonate of sodium), a native hydrous silicate of sodium and aluminum, having the chemical formula $Na_2Al_2Si_3O_{10} + 2H_2O$, and crystallizing in slender prismatic forms belonging to the orthorhombic system. It is transparent to translucent, and usually white (or nearly so), with a vitreous lustre, a hardness of from 5 to 5.5, and a specific gravity of from 2.20 to 2.25. It occurs in cavities in basaltic rocks, and in seams in granite, gneiss and syenite. It occurs in many parts of Europe, and fine crystals are found in southern Norway. In the United States the mineral occurs in Connecticut, New Jersey and Arkansas, and also in the Lake Superior region. It is likewise found in Nova Scotia. Natrolite takes a good polish, and has been used as a gem stone.

NATRON, a carbonate of soda or mineral alkali, $Na_2CO_310H_2O$. It is produced from the ashes of several species of marine plants and is also obtained by evaporating the waters from some mineral springs. It is also found as an efflorescence in the ground. It occurs in nature, but only in solution, and is generally found in an impure state, being mixed with other sodium salts, such as the sulphate and chloride. The soda lakes of Egypt have supplied great quantities of this substance for many centuries; it was used by the ancient Egyptians as an important ingredient in their embalming fluids. A similar but impure hydrogen sodium carbonate is found deposited by evaporation on the shores of the Caspian and Black seas, also on the banks of alkali lakes and springs in California, particularly in the neighborhood of San Bernardino.

NATTER, Heinrich, Austrian sculptor: b. Graun, Tyrol, 16 March 1846; d. Vienna, 13 April 1892. He was five years apprentice to a sculptor in Meran and subsequently was taught drawing at Augsburg by Johann Guyer, a famous painter of humorous genre. Subsequently he studied with great profit under Max Widnmann (q.v.), the sculptor, in the Munich Academy. Weak health compelled him to travel and he visited Riva on Lago de Garda and Venice, until the war of 1866 called him to active military service. He afterward took up his residence at Munich, where he made his reputation by his portrait busts, sepulchral statues, a colossal statue of the god ‹Odin› (1873) and the head of a ‹Sleeping Satyr.› A career of wider activity opened for him after his settlement in Vienna, where, besides numerous bust portraits and monuments, he executed the statue of Zwingli for Zürich; the statue of Haydn for Vienna; the portrait statue of Laube and Dingelstedt for the municipal theatre of that city; and the statue of Walter von der Vogelweide for Bolzano (1889). His statue of Andreas Hofer, which is his masterpiece, was unveiled after the sculptor's death on a height near Innsbruck. A poetic delicacy of conception and a certain life-like expression, oftener found in painting than in sculpture, are the characteristic features of his work. His literary remains were published by L. Speidel, under the title ‹Kleine Schriften› (1893).

NATTERJACK, an Old World toad (*Bufo calamita*), light-brown in color, spotted with patches of a darker hue. It does not leap or crawl like the common toad, but rather runs, whence it has the name of walking or running toad. It has a deep and hollow voice, audible at a great distance, and is often found in dry situations.

NATTIER, nä-tē-ā, **Jean Marc**, French painter: b. Paris, 1685; d. 1766. He was the pupil of Jean Jouvenet, won the Academy prize in 1700 and became professor of the Academy in 1752. His fame as a portrait painter was increased by the visit he paid to Antwerp in 1715 to paint likenesses of Peter the Great and his wife Katharine I; he also painted the portraits of many of their suite. So great was his skill in portraying the fine ladies of his day that he has done as much to immortalize such faces as those of Marie Lesczynska, Henriette de France, Madame Adelaide, Madame de Chateauroux, Madame de Flavacourt and many others of the court of Louis XV, as Rigaud (see RIGAUD, HYACINTHE) had done for Bossuet, for Louis XIV, his courtiers and other leading men of the period. His subjects are usually treated as mythological themes. Specimens are to be found in the Louvre, Dresden, Stockholm and the various museums of Paris and London. The Princess de Condé as «Diana» is in the Metropolitan Museum in New York. Consult ‹Masters in Art› (Vol. III, Boston 1902) and Pierre de Nolhac, ‹Nattier, pientre de la cour de Louis XV› (Paris 1910).

NATTY BUMPPO, the central figure in Cooper's (see COOPER, J. F.) stories: ‹The Pioneers› (1823), in which he appears as «Leatherstocking,» a name lent to the series as the ‹Leatherstocking Tales›; ‹The Last of the Mohicans› (1826), in which he is known as «Hawkeye» and «Le Longue Carabine» («The Long Rifle»); and ‹The Pathfinder› (1840) and ‹The Deerslayer› (1841), in which his respective sobriquets furnish the titles of the volumes. Lounsbury (‹Life› of Cooper, 1884) has called him «one of the few original characters, perhaps the only great original character, that American fiction has added to the literature of the world.»

NATUNA (nä-too'nä) **ISLANDS**, East Indies, a chain of islands in the South China Sea, extending northwest from Cape Api, Borneo, and belonging to the Dutch. The principal islands are Great and South Natuna islands and Stokong. The aggregate area is estimated at over 800 square miles. The islands are mountainous and densely forested; the chief products are cocoanuts, fish, rice and maize. Pop. 9,000, mostly Malay fishermen.

NATURAL BRIDGE and **NATURAL ARCH.** A natural bridge has been defined as a «natural stone arch that spans a valley of erosion. A natural arch is a similar structure which does not span a [true] erosion valley.» These forms are produced in numerous ways. Most of our larger natural bridges are the result of the cutting through of the necks of deeply-entrenched meanders (q.v.), so that the river cuts off an oxbow, just as on a typical modern flood plain, except that the meander is in a deep gorge or valley and cuts through the narrow neck of rock *underneath* the surface. (See MEANDERS). This is the origin of the famous Pont d'Arc in France. The group of natural bridges in Southern Utah are also of this type. The most noted of these are the Augusta, Edwin, Caroline and Rainbow bridges. The Augusta Bridge has a height of 265 feet, a span of 320 feet, a thickness of arch of 83 feet and a width of roadway of 35 feet.

In limestone regions, solution along joints may form long tunnels, or, if only part of the tunnel roof remains, natural bridges. Sometimes in case of waterfalls, part of the water, before reaching the brink of the fall, may work down through a joint in the bed and come out below the fall. If this passageway enlarges sufficiently to accommodate all the water of the stream, the former fall may be abandoned, leaving its old crest line as a natural bridge. The famous natural bridge of Virginia is perhaps of this or similar origin. It is 236 feet high, has a span of about 50 feet and a thickness of arch of about 40 feet. Other natural bridges are formed by various other means, as by wind erosion undercutting ridges in deserts, wave erosion along shore lines, the falling in of parts of roofs of caves, leaving part of the roof as a bridge and many other minor causes. Consult Cleland, ‹North American Natural Bridges› (in Bulletin of the Geological Society of America, Vol. XXI, 1910, pp. 313–338).

NATURAL GAS. See GAS, NATURAL; MINERAL PRODUCTION OF THE UNITED STATES.

NATURAL HISTORY, in its widest sense, that department of knowledge which comprehends the sciences of zoology and botany, chemistry, natural philosophy or physics, geology, palæontology and mineralogy. It is now, however, commonly used to denote collectively the sciences of botany and zoology, or these together with geology, mineralogy and palæontology, exclusive of physics and chemistry, and it is sometimes restricted to denote the science of zoology alone.

NATURAL HISTORY OF SELBORNE, The, a celebrated work by Gilbert White (q.v.), published in 1789. Its material consists of White's letters to Daines Barrington and Thomas Pennant (qq.v.), in which the writer describes outdoor life in the little Hampshire village which his works made famous and interesting alike to students of nature and to lovers of good books, among which the ‹Natural History› ranks as a unique classic of science and of letters.

NATURAL LAW. See LAW, NATURAL.

NATURAL LEVEES, embankments built by a river on either side of its channel. When a river is in flood and overspreads its flood plain, there is a constant checking of velocity where the moving water of the channel comes into contact with the stagnant water of the adjacent plain. At this point on either side, the greater part of the river's load of mud and sand is dropped, until a ridge is built up on each side, known as a natural levee. By this process the Mississippi has raised its course many feet above the general level of its flood plain.

NATURAL NUMBERS. See ALGEBRA.

NATURAL PHILOSOPHY. See PHYSICS.

NATURAL RESOURCES. See CONSERVATION OF NATURAL RESOURCES.

NATURAL RIGHTS. See LAW, NATURAL.

NATURAL SELECTION, the doctrine advanced by Charles Darwin and almost coincidentally by Alfred Russel Wallace (q.v.), to account for the divergence of animal forms and their gradual separation into distinct species and groups, by a process akin to the selective mating practised by men in rearing and perpetuating breeds of domestic animals. It forms the basis of Darwin's hypothesis of organic development by descent, and depends upon the fact that variations constantly appear in animals, and may in some degree be perpetuated. These variations may be minute fluctuations on either side of a mean, a little more of one character and a little less of another; or they may be sudden steps of considerable magnitude; in other words, they may be continuous or discontinuous. They may visibly affect only one character at a time, or they may affect many parts of the organism at once, as if there were a general movement to a new position of organic equilibrium.

(2) Living creatures are involved in a manifold and intricate struggle for existence, varying greatly in its form and in its intensity, and due to a variety of causes. It is necessitated especially by two facts: first, that two parents usually produce many more than a pair of offspring, and that the population tends to outrun the means of subsistence; and, secondly, that organisms are at the best only relatively well adapted to the external conditions of their life, which moreover are variable. The «struggle» may be for food or foothold, for mates or property, for self-preservation or for the welfare of the young, including much more than an internecine scramble around the platter which contains the necessaries of life; the phrase is applicable as regards relative length of life, vigor or constitution, success in having offspring, and so on.

(3) In this struggle for existence the relatively less fit organisms are weeded out or eliminated, and sometimes only a small proportion of those born survive to become adults or reproductive. But it must be clearly understood that elimination does not necessarily involve sudden death or no offspring; it may simply involve, in the first instance, a slightly shorter, less successful life, or a smaller, less vigorous family. Yet whether the eliminative process be gentle or severe, the result is the same — that the relatively more fit variants tend to survive; and since many variations are demonstrably transmissible from generation to generation, and may, through the pairing of similar or suitable mates, or in other ways, gradually increase in amount, the eliminative or selective process works toward the establishment of new adaptations and new species.

The three steps in the argument are thus: (1) The occurrence of transmissible germinal variations is a fact of life; (2) the struggle for existence is a fact of life; and (3) the elimination of the relatively less fit is a fact of life. The result has been, and is, the rise and progress of new adaptations, new varieties, new species, new types.

A formidable objection to the selection theory, first clearly stated by Prof. Fleeming Jenkin, is that variations of small amount and sparse occurrence would tend to be swamped out by intercrossing. In human or «artificial» selection, the breeder takes measures to prevent this by pairing similar or suitable forms, but what in nature corresponds to this action of the breeder? Various suggestions have been made in answer to this objection. Thus Weismann says: «The necessary variations from which transformations arise must in all cases be exhibited, over and over again, by many individuals,» and in his ingenious theory of Germinal Selection he has suggested the internal mechanism by which this result may come about.

But the answer at present most relied on is that worked out by Romanes, Gulick and others — the theory of isolation (q.v.). The theory of isolation emphasizes the great variety of ways in which, in the ordinary course of nature, the range of intercrossing may be restricted, for example, by geographical barriers, by differences in habit, by psychical likes and dislikes, and by those remarkable reproductive variations which cause mutual sterility between two sections of a species living on a common area.

Another point that has been brought out by De Vries (q.v.) is that variations are not necessarily minute at the start, and that new species may spring into existence at once by what he calls a mutation. Of course, the later history of such a species is conditioned by natural selection.

We have given a statement of the theory of natural selection very much as it might have been given in 1859, when Charles Darwin and Alfred Russel Wallace enriched biology by their independent exposition of the selection idea; but since then our knowledge of the nature and origin of variations has greatly increased, the analysis of the various modes of inheritance has become much more precise, the difficulty of proving any instance of the transmission of «an acquired character» or direct somatic modification is generally acknowledged, and we have recognized the value of a second directive factor in evolution, namely, isolation. It may be said that the theory of natural selection is now being subjected to more severe and more dispassionate criticism than it had to encounter in the early Darwinian days, when the validity of the general evolution idea was the central subject of discussion.

Thus there is a demand for some serious attempt to measure the intensity of the struggle for existence in typical cases, and for evidence that the absence of a particular variation in certain members of a stock does really determine their elimination. In other words, evolutionists have awakened to the necessity of testing natural selection in relation to actual cases.

Lastly it should be noted that the doctrines of Lamarck, which were that use-and-disuse, inheritance of acquired characters, and other factors were more potent than natural selection, have been revived and strengthened by a school of naturalists who insist that they must at least be held to have had an important share in the phenomena of biology.

Bibliography.—Darwin, 'Origin of Species' (6th ed., 1882); 'Descent of Man' and other works; Wallace, 'Natural Selection' (1869; revised ed., 1891); 'Darwinism' (1889); Huxley, 'Lectures on Evolution' and other works; Gray, 'Darwiniana' (1876); Weismann, 'Essays upon Heredity' (1892) and other works; Romanes, 'Darwin and After Darwin' (1892–95); Osborn, 'From the Greeks to Darwin'

(new ed., 1909); Morse, 'Is Darwin Correct?' (London 1911), and the writings of Allen, Bates, Bateson, Beddard, Belt, Brooks, Cope, Forbes, Gadow, Haeckel, Hyatt, Lankester, Morgan, Packard, Poulton, Semper and zoologists generally. See DARWINIAN THEORY; EVOLUTION.

NATURAL THEOLOGY, or NATURAL RELIGION, that knowledge of God's existence and nature which mankind learn from observation of the world of nature. Biblical theology, or, as it is more commonly called, «revealed religion,» is the knowledge of God's nature and operations derived from revelation; and revelation is impossible unless we first postulate a personal God. Thus natural theology is the foundation of any system which professes to give an account of the Supreme Being as well as of man's origin and destiny.

Method of Natural Theology.— The first proposition postulated in this department of speculation is that every effect requires a cause (q.v.). One of the self-contradictions of Lucretius is contained in his axiom *ex nihilo nihil fit* («nothing can come from nothing»). after pronouncing which he proceeds in his attempt to prove that the order and uniformity of nature proceeds from nothing, that is, random disorder, the fortuitous concourse of atoms. Unless it is admitted that certain events and phenomena are invariably connected as cause and effect, there can be no science of natural theology, which is based upon the assumption that causation is a fact, the truth of which is accepted among the intuitive beliefs of the human mind.

How far a Science.— As Natural Theology claims for its domain the physical, intellectual and moral nature of man as well as the world of nature in the midst of which he is set, it starts out by saying with Natural Science that the present constitution of things had a beginning. Plants and animals did not always exist on this planet. The questions arise, Whence did they come? How came man here? The theory that individual species as at present existing was the original form of organic life on the earth has now been abandoned, and two other theories have replaced it: (1) That animals and plants have been produced by forces eternally and necessarily inherent in matter (see NATURALISM); (2) that nature is the product of a personal being, acting with deliberate design. In the history of recent speculation we come upon a suspensive judgment in this question; on the other hand Positivists (see POSITIVISM) have ruled it out from the field of human speculation. Suspensive reasoners do not profess to know because they declare the matter unknowable. This is agnosticism (q.v.) and its adherents style themselves agnostics. On the other hand, observers of nature have remarked in the works of nature an analogy with and a resemblance to the works, contrivances and methods of human artificers. They have accordingly reached a belief in a transcendently great and powerful maker who has originated all things. The existence of man as an individual person has been taken as testimony to the existence of an infinite and eternal being as the one supreme God. It has also been averred that anti-intuitionalists destroy the basis of all knowledge and science and that a physicist who denies causation sweeps away the foundation on which his system is reared.

Main Arguments.— (1) It is claimed that the idea of God's existence is innate in every human being and is as necessary a fact of consciousness as his own personal identity. In the most rudimentary and debased tribes is found this sense of a Supernatural Power. Lubbock and others deny to some degraded races this innate idea; it is sometimes added that deaf-mutes are in the same mental condition. It does not, however, follow because an idea has not been expressed in language that it is, therefore, not present in the mind. The mind may not have been explored by the subject; the readiness with which belief in the supernatural is accepted by savages and children is one reason for the belief that the response they make to communications on this subject springs from previous divinations of the consciousness in realizing itself. If this idea is not innate it is certain that the faculties of the human mind are such that the study of nature, man, and the obligations of life bring each individual face to face with the notion of God. Descartes, Leibnitz and others aver that the capacity of the human mind to entertain the conception of a being perfect and omnipotent, proves the existence of a reality which corresponds to such a conception; but their argument has not satisfied metaphysicians such as Reid and Stewart and, through the metaphysical subtilties involved in it, must be laid aside as a popular argument. (2) The study of nature and of history, that is, of man as a physical, intellectual and moral being, furnishes material for arguments from design, teleological arguments as they are sometimes called (see TELEOLOGY). This is the simplest and most obvious form of argument to be put forth in Natural Theology and has been put forth in all ages. Socrates constantly stated it; Cicero enforced it among his Roman followers. Although on the first publication of Darwin's and Wallace's theory of evolution it lost its place of importance in Apologetics, it was soon perceived that the theory of Natural Selection in fact multiplied many fold the evidences of design and ordination, and raised the level of intelligence to a higher plane. In consequence Natural Theology has recently been revived and stated with renewed force. The laws of Natural Selection and Survival of the Fittest must have had a law-giver, and the discovery of additional links in the chain of causation does not necessarily destroy its continuity. The argument now includes the concept that the world is not a finished product, but is even now in process of evolution. The Hebrew writers constantly refer to the power and goodness of Jehovah as evidenced both in the works of nature, the events of history and the faculties of mankind. Saint Paul begins his Epistle to the Romans with this argument against the degraded paganism of Rome; the Fathers have enforced it over and over again. Paley's 'Natural Theology' has been a most important statement of the argument from design which has been enlarged in its application by Chalmers, Tulloch, McCosh and Agassiz. The argument from design can of course only prove the existence of a Creator of the world. Man alone is conscious of a Creator, who, however, need not be the self-existent God, but once grant that man has a maker, and it would at once follow that a supreme self-existent God exists who is the

First Cause. Consult Xenophon, ‹Memorabilia›; Plato, ‹Laws X›; Cicero, ‹De Natura Deorum›; Descartes, ‹Principia Philosophiæ›; Leibnitz, ‹Theodice›; Paley, ‹Natural Theology›; Chalmers, ‹Natural Theology›; McCosh, J., ‹Christianity and Positivism› (New York 1875); Seeley, J. R., ‹Natural Religion› (Boston 1882); Robinson, E. K., ‹The Religion of Nature› (New York 1906); Shearman, J. H., ‹The Natural Theology of Evolution› (New York 1916); Thackray, E., ‹The Revelation of God in Nature and Man› (London 1916).

NATURAL TONES are tones produced by the natural alteration of nodal points in wind instruments by pressure only. See HARMONICS.

NATURALISM, a term which, in the history of philosophical thought, has received a variety of meanings. In general it refers to that which is in accordance with nature. But the sense in which the term nature may be used is not by any means a constant but a variable, and as this sense varies we will find a set of corresponding meanings for naturalism itself. Nature may be considered as that which is the opposite of the artificial, the conventional or the traditional. Regarding nature from this point of view, the term naturalism will be employed in much the same sense as that in which Rousseau used it in his plea for a return to nature in matters philosophical, religious and political. Or nature may be regarded as the external reality which furnishes the material of all our sensations; naturalism will then signify in the Lockeian sense that which is original and fundamental in knowledge as opposed to that which is the result of the operations of the human understanding. Again, nature may signify the basis of natural affections and dispositions as opposed to the fundamental principles of conduct which are revealed in the «dry light of reason.» In this sense Shaftesbury uses nature and naturalism in contrast to the rationalistic ethic of his day. Naturalism also has been used as a term to characterize such a philosophical system as that of Giordano Bruno, which identifies God with nature, and does not distinguish between the Creator and his works. In the midst of this confusion of meanings, however, the present day discussions in philosophy have established a determinate usage which for the most part is uniformly recognized, and consistently employed. This usage is quite different from any of the phases which have been mentioned, and may be defined somewhat as follows: Naturalism signifies a method of interpreting the subject matter of philosophy, which insists that all phenomena whatsoever are to be explained according to the laws of nature, that efficient causes only are to be regarded, while all considerations of final causes are to be rigorously excluded, as well as those alleged ideal implications of reason which postulate some metaphysical necessity as a mode of interpreting physical phenomena.

In this sense naturalism, as regards psychology, grounds all psychical phenomena upon a purely sensationalistic basis; there is no self in the sense of an organizing power and unitary centre in the midst of the various states of consciousness; the spiritual elements of consciousness are regarded as incidental, and determined at the last analysis by the cosmic processes. As a theory of knowledge, there is no place for an idealistic construction of the data of experience. In ethics, naturalism is a science of what is and not of what ought to be. It allows a science of ethics but not of metaphysics. It cosmology essays an explanation of the universe in terms of the laws of nature which inductive research may have discovered, but it has no concern or interest as to the question whether «through the ages one increasing purpose runs.»

A system of naturalism, however, is not necessarily a philosophy of materialism any more than it is necessarily pantheistic, although it must be acknowledged that naturalism and materialism are often used as synonymous terms. It is not used in the present day as a term opposed to supernaturalism, as it is essentially a philosophical term and not used in a theological sense. It does not deny a supernatural reality in the theological sense; it is merely not interested in the questions which turn upon a beyond and above as regards human thought and human activity.

The antithesis which the term naturalism suggests does not lie in this direction. To understand the significance of naturalism, and it must be understood in order to appreciate in any adequate measure the philosophical problems of the day, the exact antithesis which is implies must be clearly apprehended. The antithesis is between an explanation of the phenomena of existence which can be expressed solely in terms of the laws of nature, and all explanations on the other hand which involve fundamental thought necessities as essential factors. The antithesis is between the natural and the rational, between the natural and the spiritual. This usage of the term we find in such a book as that of Balfour's ‹Grounds of Belief,› or in Ward's ‹Naturalism and Agnosticism,› or in Sorley's ‹Ethics of Naturalism.› When Mr. Balfour's book was first published he was severely criticised in some quarters for his use of the term naturalism. This evoked much discussion, which has served to establish a definite and determinate sense in which the term may be used. A most able and satisfactory defense of Mr. Balfour's usage of the term is to be found in the work of Prof. Andrew Seth, entitled ‹Man's Place in the Cosmos.› One of the essays is ‹The Use of the Term Naturalism,› and it is one of the best discussions to which any student of the subject can be referred. Without doubt, the element of variability which has attended the history of this term has been to a large extent, if not altogether, removed, and a constant significance has resulted which conforms to the general usage of the present time; and the significance is the one which it has been the endeavor of this article to present.

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NATURALISTS, American Society of, an association numbering 230 active members, organized in 1883, for the purpose of bringing together persons interested in topics of natural history.

NATURALIZATION, the act of renouncing allegiance to one government and acquiring the rights of citizenship under another. In its broadest sense it signifies the act of adopting a foreigner into the body politic and of clothing him with the privileges of citizenship. This may result from the annexation of territory, the marriage of an alien woman to a citizen, the naturalization of the parents of children, the purchase of real estate in some countries, service in the army and the navy, etc. In a more restricted sense the term has reference to the issuance of a certificate of citizenship by a court or an administrative officer after the fulfilment by the applicant of certain prescribed conditions. With a few exceptions the rights of the naturalized person are equal in all respects to those of the native-born citizen; thus in the United States, while the civil rights are the same, the Constitution excludes the naturalized citizen from the offices of President and Vice-President. In Great Britain a naturalized subject enjoys all the political and civil rights of a native-born subject except that when he is in the territory of his original state he is not entitled to protection unless the consent of his orginal government to be naturalized abroad was obtained. The British naturalization commission of 1901, however, recommended that this exception be abolished. The government of the United States makes no such exception in the case of naturalized citizens. They are protected equally with naturalized citizens in their country of origin whether the consent of their governments to emigrate was obtained or not. The act of becoming naturalized, however, does not abrogate the claims of the government under which the person concerned had previously lived and which were operative at the time such person changed his allegiance, especially in the case of attempts to avoid compulsory service in the army of the native country, and the laws of the United States do not afford protection for aliens who simply become citizens of this country for the purpose of escaping such service. But a distinction is made between the obligations of military service that have accrued at the time of emigration and those which have not. In the latter case the government insists that the citizen cannot be held by his original state to a performance of the obligation.

The majority of treaties with other countries call for a continuous residence of five years before admission, the notable exception being Great Britain, with whom the treaty allows of interexchange of citizenship with no stated period of residence. Treaties of this nature were negotiated with the North German confederation, and also with Bavaria, in 1862, but the Bavarian treaty will not allow of natives, who have emigrated to other countries before serving the required time in the army, again becoming permanent residents until they are 32 years of age; but if a certificate of immigration be granted by the terms of this treaty, naturalization does away with the military obligation. Such treaties were also made in 1868 with Baden, Belgium, Bavaria, Hesse, Mexico, the North German confederation, and Würtemburg; in 1869 with Sweden and Norway; in 1870 with Austria and Great Britain; and in 1872 with Denmark. At present all states except Russia and Turkey allow their citizens or subjects to expatriate themselves voluntarily and to adopt a new allegiance. The two latter states, however, refuse to recognize the legality of naturalization certificates granted to subjects by foreign governments without their consent previously obtained. Other states attach certain conditions to the exercise of the right of expatriation. The laws of the United States, however, declare it to be an inalienable right of all peoples and the consent of the government is not required.

In the United States, Congress by the Constitution has exclusive power over the naturalization of citizens, and the power cannot be exercised by the individual States, but this does not prohibit the State from granting the rights and privileges of State citizenship, such as voting at State elections, holding offices, etc. See NATURALIZATION LAWS; CITIZENSHIP IN THE UNITED STATES; ALIENS; ALLEGIANCE; NATIONALITY.

NATURALIZATION LAWS, acts placing foreign-born persons in the same legal position as natural-born citizens. The conditions under and the manner in which an alien may be admitted to become a citizen of the United States are prescribed by the United States Revised Statutes.

Declaration of Intentions.— The alien must declare upon oath before a Circuit Court or a District Court of the United States or a District or Supreme Court of the Territories, or a court of record of any of the States having common-law jurisdiction and a seal and clerk, two years at least prior to his admission, that it is, bona fide, his intention to become a citizen of the United States, and to renounce forever all allegiance and fidelity to any foreign prince or state, and particularly to the one of which he may be at the time a citizen or subject.

Oath on Application for Admission.— He must at the time of his application to be admitted declare on oath, before some one of the courts above specified, «that he will support the Constitution of the United States, and that he absolutely and entirely renounces and abjures all allegiance and fidelity to every foreign prince, potentate, state or sovereignty, and particularly, by name, to the prince, potentate, state or sovereignty of which he was before a citizen or subject,» which proceedings must be recorded by the clerk of the court.

Conditions for Citizenship.— If it shall appear to the satisfaction of the court to which the alien has applied that he has made a declaration to become a citizen two years before applying for final papers, and has resided continuously within the United States for at least five years, and within the State or Territory where such court is at the time held one year at least; and that during that time «he has behaved as a man of good moral character, attached to the principles of the Constitution of the United States, and well disposed to the good order and happiness of the same,» he will be admitted to citizenship.

Titles of Nobility.— If the applicant has borne any hereditary title or order of nobility he must make an express renunciation of the same at the time of his application.

Soldiers.—Any alien of the age of 21 years and upward who has been in the armies of the United States, and has been honorably discharged therefrom, may become a citizen on his petition, without any previous declaration of intention, provided that he has resided in the United States at least one year previous to his application, and is of good moral character, (It is judicially decided that residence of one year in a particular State is not requisite).

Minors.— Any alien under the age of 21 years who has resided in the United States three years next preceding his arriving at that age, and who has continued to reside therein to the time he may make application to be admitted a citizen thereof, may after he arrives at the age of 21 years, and after he has resided five years within the United States, including the three years of his minority, be admitted a citizen; but he must make a declaration on oath and prove to the satisfaction of the court that for two years next preceding it has been his *bona fide* intention to become a citizen.

Children of Naturalized Citizens.— The children of persons who have been duly naturalized, being under the age of 21 years at the time of the naturalization of their parents, shall, if dwelling in the United States, be considered as citizens thereof.

Chinese.— The naturalization of Chinamen is expressly prohibited by the Laws of 1882. Under the naturalization laws now in force, only «white» persons and persons of «African nativity and of African descent» are eligible to naturalization. Japanese, Burmese and Hawaians have generally been held by the courts not to be included within either category and therefore not eligible. Indians are excluded under the general laws, but they may and often have been naturalized by special acts or by treaty. They may also acquire citizenship by taking up public land and separating themselves from their tribes. Polygamists and anarchists are debarred from naturalization by recent acts of Congress.

Protection Abroad to Naturalized Citizens. — The Revised Statutes of the United States declare that «all naturalized citizens of the United States while in foreign countries are entitled to and shall receive from this Government the same protection of persons and property which is accorded to native-born citizens.»

The Right of Suffrage.— The right to vote comes from the State, and is a State gift. Naturalization is a Federal right and is a gift of the Union, not of any one State. In nine States (Arkansas, Indiana, Kansas, Missouri, Nebraska, South Dakota, Texas, Oregon and Wisconsin) aliens who have declared their intention to become citizens are allowed to vote equally with naturalized or native-born citizens. By an act of Congress passed in 1906, 90 days must elaspe before naturalization and the exercise of the right to vote. This law was designed to prevent the wholesale naturalization of foreigners in the large cities for the purpose of making voters of them for the forthcoming election. The Federal naturalization laws apply to the whole Union alike, and provide that no alien may be naturalized until after five years' residence except in the case of aliens who have served in the army and been honorably discharged, in which case one year's residence suffices. Even after five years' residence and due naturalization he is not entitled to vote unless the laws of the State confer the privilege upon him, and he may vote in several States six months after landing, if he has declared his intention, under United States law, to become a citizen.

In Other Countries.—In France a foreigner who has obtained permission to become domiciled in France is entitled to letters of declaration of naturalization after three years' residence. Also, by the French Naturalization Act, 1889, a foreigner who has resided in France for 10 years may at once be naturalized without preliminary ceremony. In Germany naturalization can be conferred only by the higher administrative authorities; the applicant must show that he is at liberty, under the laws of his native country, to change his nationality, or, if he is a minor, that his father or guardian has given him the requisite permission, that he is leading a respectable life, that he is domiciled in Germany, and that he has the means of livelihood. In all countries a married woman is held to be a citizen of the state of which her husband is for the time being a subject, and the naturalization of a father carries with it that of his children in minority. In countries where military service is compulsory naturalization in fraud of this either is prohibited or renders the offender liable to imprisonment, if he returns, and forfeiture of all property subsequently acquired in his native country. In Great Britain five years' residence is necessary, except where the applicant is in the service of the Crown the certificate is granted by one of the secretaries of state. But the British government, unlike that of the United States, will not protect a naturalized subject within his state of origin unless he has ceased to be a citizen or subject thereof in pursuance of its laws or of a treaty stipulation. Thus a Russian or Turkish subject naturalized in Great Britain will not be accorded the protection of the British government upon return to his native state if the consent of his government to naturalization in a foreign country was not obtained. Certain privileges of British nationality may be acquired by the issue to an alien of letters of denization granted by the Crown; and for this no previous residence is required.

Naturalization by Incorporation.— Citizenship has often been conferred on large bodies of inhabitants by the annexation of territory as a result of cession or conquest. It was in this way that the inhabitants of Louisiana, Florida, Texas, Alaska and Hawaii became citizens of the United States. For other modes of acquiring citizenship, also modes by which citizenship may be lost. See CITIZENSHIP IN THE UNITED STATES. See also ALLEGIANCE; ALIENS; NATIONALITY.

Bibliography.— See the authorities cited in the article on CITIZENSHIP IN THE UNITED STATES.

NATURE GODS. See NATURE WORSHIP; MYTHOLOGY; AMERICAN MYTHOLOGY.

NATURE PRINTING, a modern process for obtaining impressions directly from objects themselves and printing therefrom. In one method the object which must have a tolerably flat surface such as a fern frond, is placed between a steel plate and one of heated lead and subjected to a strong pressure, forming an exact intaglio copy in the lead from which impressions are taken. The plate is too soft for practical purposes, but it is generally copied by electrotyping on a copper plate if it is to be used many times. The process was invented in 1849 by Alois Auer, director of the state printing establishment of the Austrian Empire. In 1854 he published a detailed account of this method of printing.

NATURE STUDY, an educational means of training the mind of the pupil, by direct observation, to a knowledge and love of the common things about him. Nature study attempts to aid, in the most effective way, through the natural and inherent instincts of all children, the perfect development of the child nature, in accordance with the natural laws of that development. It aims at taking into account the various activities, interests, likes and dislikes of children, their love of activity, their desire to hear, to see and to handle things; to investigate all that they come into contact with and to ask questions about everything that interests them. Nature study accepts the fact that this almost constant activity is the one great law of the child's development, physically and mentally; and it acts upon it. It attempts to direct this activity into the most useful and interesting channels so as to secure for the child the greatest pleasure in doing, with the greatest benefit from the deed accomplished. It seeks to give him direct contact with things rather than to know them by descriptions of them. It makes prominent use of the fact that the human being is essentially an imitator and that the child, especially, is possessed of an irresistible desire or impulse to do what he sees his elders or his companions doing. All these are classed as nature motives; and nature study makes use of them to the exclusion of motives that are merely artificial. In other words, it works on the assumption that every normal child is born with an instinctive desire to investigate things and sensations, and through this investigation and the experience gained thereby, to get a knowledge of his environment.

A second quality as strongly a part of the child nature as his irresistible impulse to investigate is his strong social instinct. This enables him to identify himself with those about him and with all their various interests and to realize his relationship to them; and it creates in him a desire to conform to the social judgment of his associates, that is to public opinion. Nature study attempts to develop the life of the child along the lines of its proper relationship to nature; that is, to mankind and the world about him. Another prominently developed instinct of children is the desire to be useful and helpful. Nature study attempts also to make use of this and all other instincts and tendencies of the child so as thus to be able to lead him along the path of development that nature has destined for him and, in this way, infuse a real interest into his work through the inspiration of a desirable object to be attained. Nature study may, therefore, be said to be an element of practically every subject of study in which the child succeeds in becoming interested. The sawing of a board or piece of wood interests the young child, apart from the actual act of sawing. The nature of the wood; the motions of the person sawing; the teeth of the saw; the saw-dust; the severed pieces of wood; the picking up and carrying of the wood from one place to another; all these actions are naturally related to the child's life; and they are, hence, proper subjects of nature study, just as much as animals, trees and flowers and their actions, colors, forms, sizes and relationships are.

Nature study recognizes the fact that child life and school life, to a very considerable degree, reflect the life of the community and exhibit the child growing naturally and rapidly into the more extensive life of that community. It attempts to so direct these natural child interests as to enlarge the childish vision and to prepare the child for the coming greater activities of adult life, through proper perception and correct thinking and reasoning. Its sphere is, therefore, the whole field of animate and inanimate life, in which the child gains his early self-education, largely by observation; for with him literally «seeing is believing»; and to this may be added tasting, touching and handling, which nature study helps him to do effectively, intelligently and with added pleasure.

History.— Nature study, as a name, is quite recent, but as an actual fact it is old in a part of its development at least. However, it remained for recent advocates of nature study to give it a permanent place upon the curriculum of the public schools, and later, the high schools and colleges. Socrates and Aristotle advocated and employed methods in teaching very much like those insisted upon by the modern teacher of nature study. But probably their methods were but echoes of a very general and widely extended custom of nature study. The American Indians, over practically the whole extent of the two continents, had systems of instruction fitted, in the case of each tribe or nation, to its own peculiar condition and racial requirements. But in every case this instruction was carried on very largely along the lines laid down by the modern advocate of nature study. In the case of the North American Indians, the young brave had practically all his instruction in the haunts of nature where he learned to know all about the wild animals of the forest, the birds, the fishes, the trees, the winds, the weather, the seasons and the manifestations thereof. In short, his life was as close as it possibly could be to nature. Even among the Aztecs, the Mayas and the more cultured races of Mexico, Central America and the west coast of South America, the system of instruction was essentially the same for the great mass of the people, who were kept very much nearer to nature's heart than they are to-day. So nature study is little more than getting back to the earlier methods of instruction which was still very much alive when the Great Teacher said: «Consider the lilies how they grow; they toil not, they spin not; and yet I say unto you, that Solomon in all his glory was not arrayed like one of these.» At the beginning of the Christian era the philosophers of the Roman Empire were in the habit of teaching their pupils in the open; and traveling teachers frequently went about from place to place, at times accompanied by pupils who formed a following; and thus accompanied, they taught on the open market places, in front of the temple and other public places where the masses were accustomed to congregate. This custom was undoubtedly the survival of a very much earlier and more general custom in which nature teaching must have played a prominent part, if we are to judge from survivals of this very ancient open air teaching in many southern countries to-day and of real nature study and teaching among such semi-barbaric and semi-civilized races as have developed systems of instruction fitted to their several needs.

The Renaissance brought forth teachers who strenuously advocated more natural methods in teaching, not only languages but all other subjects. Of these men the most prominent, the greatest and most far-seeing was Rousseau, some of whose more advanced ideas are but beginning to be realized to-day. Pestalozzi, Froebel and their followers and the modern kindergarten teachers have all been working closer and closer to the goal of nature study whose principles they have been following, consciously or unconsciously. The revolution in teaching was bound to come with the Renaissance; but it came very slowly. Men were too busy with the new learning to bother themselves about the methods of acquiring it. The thing itself was to them all important. But as the novelty wore off, teachers began to think about ways of teaching. Hundreds of methods were put upon the market, all echoes and re-echoes of one another, with here and there a glimmer of new light. But the light, though not very apparent, was really there, though hidden by many clouds of prejudice, custom, habit, misunderstanding and ignorance. The cry of men like Agassis, Rousseau, Ollendorf, Pestalozzi, Froebel, Berlitz and the whole school of natural method teachers was to get nearer to nature, to have teaching of languages conform to the natural methods by which a child acquires his mother tongue. While these men were builders, they were necessarily anarchistic, to a very considerable degree. They were bent upon sweeping out of existence the old methods which had failed to accomplish what they were intended to accomplish. They were largely anarchistic in their methods also. Let us teach as the child teaches himself, they said. Let us gather facts and impressions from nature just as we come into contact with her, «any old way,» provided we accomplish what we aim at. The result was that practically all these «natural methods» were anything but «natural.» They followed no line of development or plan; because nature's methods presented themselves to these natural method teachers as evolutionary.

Just when these unscientific methods of teaching had begun to bring discredit upon their authors and more scientific teachers had begun to protest and to replace the somewhat discredited «nature method» designation with that of direct method, teachers of natural sciences in the public schools discovered that the term was still a good one for their purposes. «Let us get nearer to nature in our teaching,» was their cry; and they shouted it as enthusiastically as though it had not been already worn threadbare. Science had just been introduced into the public schools and colleges of the country. The science teachers of the lower grades went through the same experiences as the language teachers in getting nearer to nature. The early teachers, in their protest against the too exact and dry methods of the regular science teachers, protested against any method whatever. If teachers would only get nearer to nature everything would be all right, they preached, for nature, in her kindness, would take care of them. These educational anarchists were soon, however, replaced by men of larger vision, who saw the possibilities of nature teaching if it were only organized and made to follow scientific principles and taught according to properly worked out plans by means of contact with nature supplemented by well organized laboratories of natural objects. This, however, was not done without protests from the ultra wing of the nature study teachers, who talked about the restraints of the unnatural technical science teaching and pleaded for what they denominated the natural, untrammeled development of the child's faculties from the child's point of view. In this there was a small amount ot truth and a large amount of misconception of the true functions of teaching. Their cry was a protest against the dry, formal teaching of the school room; and it served its purpose. It quickened the science teacher into action; and nature study methods entered many a science room, many a laboratory, greatly to the improvement of science teaching, and in fact, of teaching in almost every department of school and college life. Nature study was applied to literature, and literature to nature study. The pupil was taught to see the beauties and laws of nature at work in the truest of nature poems, and these poems were read, by nature teachers, as supplementary to their regular studies. This evolution shows two distinct phases, which have been indirectly indicated,—the tearing away from the old methods of teaching; and later on, the building of the new nature study structure scientifically upon the bases of the old.

Modern Development.— Nature study made its appearance as such in the latter quarter of the 19th century; and it was due, as has already been said, to the introduction of the teaching of science and vocational studies into the public schools. The common school teacher, finding it difficult to teach pupils science in the orthodox college manner, had recourse to the practice of using concrete examples and of making use of nature herself for the explanation of her moods and phases. This practice gradually grew until, in 1889, considerable attention became fixed upon it owing to the fight made by numerous teachers of elementary science in behalf of more interesting methods of presenting it to younger pupils. In this latter year W. S. Jackman planned a general course in nature study for the ward schools of Pittsburgh, which he was destined to carry out in Cook County Normal School, to which he went in the fall of the same year. Two years later his notes were published for the use of teachers and schools under the name of «Nature Studies for Common Schools.» They were much along the lines laid down several years before by Sheldon in the State Normal School at Oswego, N. Y. This movement in 1889 was noticeable in various educational centres in the Eastern States, notably in Massachusetts. In the latter State A. C. Boyden took the lead and for 10 years lectured and gave model lessons in educational institutions all over the State on nature study. He succeeded in creating a great deal of interest in the subject and in establishing centres of nature study with committees or societies, which met frequently. His methods of using printed outlines and illustrating lessons was pretty generally followed; and it was not long before it was improved upon. A special committee on nature study, meeting monthly in Boston, helped to direct the work by arranging courses of study and doing other important services for the cause. These prepared courses were distributed all over the State, and they helped to greatly increase the interest in nature study and to extend its field of influence.

Materials of Study and Organization.— In the early stages of nature study there was little attempt at the scientific organization of the materials used in teaching. As we have seen, outlines of study were formed for the guidance of teachers in their work; but they were largely suggestive and had little of the scientific about them. But gradually, as the practice of nature spread, extending to the high schools and colleges, trained teachers of science applied their methods of organization to it; and nature study gradually took form and shape as a scientific study, in which the proper relationship between the pupil, the teacher and the materials and objects used in teaching were specified and defined. This called into being large and well-appointed nature study laboratories and took possession of vacant or available used pieces of land for experimental purposes in the growing and observation of plants of many kinds by the pupils under the direction of teachers. It made use of excursions into the woods, fishing, hunting and boating trips and camping out parties. Soon a corps of trained nature study teachers sprang into being; and these, in their turn, as a result of experience gained in their work, proceeded to further organize the subjects, activities and province of nature study. The laboratory teacher, from his inside experiments, helped the work of the nature study teacher doing his work on the outside. Now there is scarcely a summer camping school that does not have its nature study director. The pupils are encouraged to form laboratories or museums of their own made during their nature studies. The school laboratories for nature study contain mounted insects, birds, animals, preserved plants, parts of trees, shrubs, plants, in fact samples of everything pertaining to nature in which the child may be made to take a natural interest. These are supplemented by geological and other specimens, models of a large number of objects of different kinds, drawings, photos, pictures, paintings, plans, designs and castings. These are again supplemented, in the larger towns and cities, by visits to art and other museums, great libraries, factories and other industrial plants, zoological gardens, parks, agricultural farms, truck gardens, hot houses, and in fact any and all places of human activities in which the pupils might be interested.

These and numerous other means of direct contact with nature and human activities and their results in manufactured forms are correlated with art study. The pupils are taught to draw, paint or color, photograph, model and represent in various ways the objects with which they come into contact during their nature study classes. Many schools make a permanent exhibition of this work; and some of these exhibits show very encouraging results, with some really beautiful and talented work. This correlated art work can, and often is made very extensive, including, for instance, the artistic arrangement of flowers, flower beds, borders, etc., the selecting of flowers and their arrangement in gardens so as to secure the blending of colors, observation of the habits of wild and domestic animals and the study of the lives of reptiles, fishes, and, in fact of all kinds of animal life. In other words, nature study is made to lead up directly to the scientific studies of the class-room. See KINDERGARTEN; FROEBEL; ROUSSEAU; PESTALOZZI.

Bibliography.— Bailey, L. H., 'The Nature Study Idea' (New York 1903); 'Garden Making' (New York 1909); Comstock, A. B., 'Handbook of Nature Study for Teachers and Parents' (Ithaca 1911); Cummings, H. H., 'Nature Study' (New York 1908); Gosse, P. H., 'Romance of Nature History' (New York 1905); Hodge, 'Nature Study and Life' (Boston 1902); Hall, C. A., 'Open Book of Nature' (New York 1911); Holly, F. L., 'Nature Study' (New York 1909); Jackman, 'Nature Study' (New York 1899); 'Field Work in Nature Study' (New York); Lange, D., 'Nature Study Hand-Book' (New York 1899); Munson, P. J., 'Education Through Nature Study' (New York 1904); Scott, C. B., 'Nature Study and the Child' (Boston 1901).

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NATURE WORSHIP. The worship of the heavens, the planets, the elements, the manifestation of all forms of life, vegetable and animal, including the personified life attributed to inanimate objects. Nature worship, though probably everywhere occasioned by the natural impulse of man to fear the terrific manifestations of nature and to show great respect for the powerful and the mysterious, has taken many different by-paths in the development of the various human races and families. The early investigators into the phenomena of natural religons failed to recognize this diversity of development, and they proceeded to build universal theories on divergent growths. Hence all of their theories have either partially or completely fallen by the wayside, or have survived the test of time only as a diminutive part of the original whole. Yet the work of the early investigator has not been done in vain; for, inasmuch as he has thought deeply he has set others thinking. Concerning no part of the extensive field of mythology have more divergent theories been advanced than nature worship. By various writers the origin of worship has been traced to ancestor deification, to the fructification engendered by earth and sky, to the fear inspired in primitive man by the lightning, storms and winds, to the fearful ravages of mysterious all-powerful beings who brought diseases and death. Others claim that the first worship of man was given to powerful and cunning animals and especially to the serpent. Still other writers have maintained that man's first gods were his own ancestors; while others see him worshiping the glory and majesty of the sun and the mystic beauty and mysterious healing powers of the moon. Others have traced his first religious ideas to the rains and the mists and have placed his primitive gods on the mountains amid the sources of the streams or in the clouds, the home of the rains.

To these early mythological investigators it never seemed to occur that man's early conceptions of this nature were not at all religious in the modern acceptation of the terms; that they grew out of fear and mysterious dread. This primitive religious conception continued one of the strong features of man's worship far down into the monotheistic age of religion. Metaphorically the Jehovah of the Hebrews was a god of mysterious might who rode upon the winds and planted his footsteps upon the storm. At the sound of the horns of the priests of Israel walled cities fell down, just as the forests of old fell before the whistles of the wind gods. The fervid poetry of the greatest of the Hebrew poets is fairly alive with images borrowed from the polytheistic nature worshipers who surrounded them or with whom the race came into contact during its periods of exile. In this Hebrew poetry every phase of nature seems alive, as it is in the Greek and Roman, Egyptian, Babylonian and Indian poetry. In primitive Hindu literature and in the poetic imagery of China and Japan nature appears as one great whole deified in different yet, in many respects, suggestively similar ways. Among the American Indians the deification of the more striking forms of nature is everywhere evident. These primitive ideas became conventionalized, elaborated, amalgamated with other ideas and they long continued to act upon and to be reacted upon by society. A primitive belief was that people were drowned because spirits hidden in the depths dragged them down. The wind was supposed to cry like a lost child. The combination of the two made the Llorona of Spanish lands in Europe and America, who, crying like a lost child, leads the unwary, after nightfall, into a pool or bog where she or her attendants catches him by the legs and drags him down to death. Many primitive nature myths and unions of myths have become much more complicated than the Llorona. In fact little in nature worship even among the most primitive races now existing is to be found in anything like its original form. Hence the analysis of nature myths is a very complex and difficult matter. Yet the general conception of how primitive man thought is not difficult to understand.

Society and Nature Worship.— Although apparently simple, all modern manifestations of worship, however primitive, are in reality very complex; for society and its beliefs have, for long ages, been continually acting and reacting upon one another. In the more primitive society existing to-day, the medicine-men are universally believed to possess spiritual or magical powers. They are generally the medium between the people and the powers of the material universe and of the future world. They thus bear, in a sense, a divine character which belongs to them through the natural logic of their official position. Here we see, in the early stage of its development, one of the powerful factors in the organization of primitive beliefs of the nature worshipers into organized and complicated mythology. The governing class, consisting of priests or medicine-men, chiefs and leading warriors, early learned to claim descent from their nature gods, about whom they began to invent and relate the stories which we now call myths. The sun became the great ancestor of the Peruvian priests and nobility, of the Mixteca warrior class, as of the ruling body of other great races, the most noted of which was the Egyptian. Once this relationship had been attained the glorification of the sun became the glorification of the ruling powers and the consequent subjugation of the masses to them. Ritual, ceremony, a highly organized and disciplined priesthood and religious society followed; and of this the governing class soon became the head. Among the Toltecs in Mexico, Quetzalcoatl the wind god became the ruling deity and his superior priests, who were always chosen from the nobility, were believed to be his representatives upon earth and his lineal, blood descendants. The royal family and the nobles also represented themselves as god-born. Very frequently the king was also high priest of the nation and as such he was known as *the* Quetzalcoatl, or the chief of the gods. The principal races of Chiapas and Yucatan also believed themselves to be descended from the wind god, while the Mixtecas and several tribes of Guatemala called themselves «Children of the Sun.» The latter wore upon their breasts and backs the yellow symbol of the sun. In Persia and Egypt the complicated court life centred on the belief of the classes and the masses in the divine origin of the priesthood and the nobility and their descent from Re, the sun god. Thus the relation of religious primitive belief to the rulers of the people developed a complicated religio-political condition that finally became very complex in its nature. Out of this condition grew the acknowledged relationship of the hierarchy of the gods. This was the birth of the great religious systems of Persia, Babylonia and Egypt, which continued to grow more complex until their ultimate decline and disappearance. This, too, is more or less the path followed by the great religions of antiquity, all of which bear plainly the marks of primitive nature worship. The development of a religious theocracy gave very specified functions to the most prominent of the deities. Thus Thoth, the Egyptian wind god, being the original messenger god, became the carrier of souls; and the moon goddess, Isis, the mother of medicine and the healing art. Thoth, as the bearer of moisture and rains and the generator of growth, became the culture god, the patron of learning and the judge of good and evil in men's lives. All these conventionalized ideas of Thoth and Isis are very far removed from primitive man's conception of the wind and the moon as factors in his life. The great changes that took place were due to the peculiar organization of Egyptian society and the antiquity of her civilization.

Animism.— Primitive man undoubtedly held beliefs that we can scarcely comprehend to-day. One of these has been termed animism, a designation that appears to mean different things to different investigators and writers using it. It has been variously defined as belief in souls, spirits and magic power.

All recent investigation tends to show that primitive man made practically no distinction as to animation or life, between himself and the active elements of nature around him. The sun, moon, stars, winds, clouds, thunder and lightning were beings like himself who had at their command very superior magic power. The stories of all Indo-Europeans and the American Indians are filled with myths depicting the contests in magic that took place between their deities and nature heroes. The Indian stories especially present characters essentially human, so human indeed that they are frequently deceived and duped not only by man himself but also by the lower animals and even at times by inanimate things. These hero characters are neither divinities, nor souls, nor spirits in the modern acceptation of the terms. They are simply the wielders of magic power. Therefore, when certain writers on mythology talk glibly about the religious emotion in the presence of nature giving birth to animism, they are speaking about the past in terms of to-day, forgetful of two facts. The first of these is that even races as far advanced in civilization as the Indians of southeastern Canada and the United States seem to exhibit no appreciation of the beauties of nature, as nature itself. The second is, that religious emotion is the result of the teachings of organized religion, exercised consciously or unconsciously to stir up such feelings. Fear and terror of any object inspired respect in all ages of the past as they do to-day. Out of these primal elemental feelings combined with that of admiration, ancient religious beliefs and systems were built up slowly from primitive nature beliefs. The belief in souls and spirits, as things apart from the existence of humanity, came very much later in the religious development of humanity.

Transmigration.—Intimately connected with animation is the belief in transmigration. In fact the one presupposes the other; and both seem to belong to certain stages in the social development of all society. The wind was a most powerful agent of destruction, the mysterious beings hidden in the clouds shouted with their thunderous voices and shot forth their darts of fire. Other beings sent forth the rain from the heavens and the mountains. Yet they all remained invisible as did the spirits that moved the trees and the water; therefore, they must possess the power of rendering themselves invisible, reasoned the nature worshipper. The same mode of reasoning accounted for spirits in everything and endowed the personified elements, planets and phases of nature with the magical power of taking upon themselves other bodily forms at will. Out of this idea of transmigration grew the Hindu belief in reincarnation, which, in the case of Vishnu (q.v.), was carried to an almost unlimited number of bodily changes, each one bringing with it a new existence upon earth. Among many fairly civilized races there still exist in the masses at least a belief in spirits that inhabit trees, rocks, lakes, rivers, mountains, hills, clouds, caves and winds; and this belief teaches us how nature worship grew up and long continued to claim the unquestioned faith of humanity. The belief that human souls may be transmigrated into the bodies of animals, and vice versa, is still held by many races and peoples, and the ghost or disembodied spirit has but recently retreated from the stronghold of science; and so recent is its departure that a goodly body of so-called scientists are gravely experimenting with and seeking data as to its existence and habits.

Another development of animism and transmigration was the belief in guardian spirits which seems to have been almost universal. Very early in his social development man is found attempting to subject to his will and his uses, by his magic, the various mysterious powers of nature. Dances, charms, incantations, amulets, magic potions and other primitive means were made use of to this end. Amulets, believed to be powerful, were carried about on the body for self-protection and the wearer made efforts to get some supernatural being to become his protector. Often this being was supposed to reside in the fetish he carried upon his person. These developed by a complexed society became, in the course of time, household gods, probably through totems. Later society made patron saints to replace the grosser conceptions of heathenism. But all hail back to nature worship with its belief in transmigrating spirits, which has been father to ghosts, fairies, pigmies and a host of good and of evil-disposed supernatural beings.

Taboo.— Connected with these supernatural beings, which later became classed as gods, demigods, ghosts, or non-natural beings, were many tabooes or restrictions on the actions of humanity with respect to these nature spirits. The taboo might be a restriction from doing a certain thing at a certain time or under a certain condition; or it might enjoin the performance of a certain act or ceremony under like conditions. The custom of observing tabooes added, in the course of time, a species of veneration and of sacredness to the act and to the object of the taboo. Thus acts intended originally for the protection of the tribe, through continued repetition, grew to be part of the most sacred ceremonies. Thus the tabooes of the nature worshipers seem to have played a very prominent part in the building up of their most revered religious rituals. The taboo was closely associated with the tribal totems and with tree and other worship.

Through long years of association with nature worship particular places, days, epochs, trees, streams and persons were looked upon as sacred and, as such, subject to taboo. The emperors of the Aztecs and the Peruvians, at the time of the discovery of America, were believed by their people to be so sacred as to be almost gods; and around them clustered as many ceremonial tabooes as about the temples of their most revered deities. But in each case these tabooes reacted upon the ruler himself, placing many restrictions upon his actions in public and in private. Moctezuma II might not place his foot upon the bare earth lest his divine character be thus soiled. So he was carried about in a palanquin by official royal bearers, while other attendants spread before him a gorgeous carpet to protect his imperial feet from contamination when he left the palanquin. He might wear a suit of clothes but once, and if state or other reasons required a change of apparel a dozen times a day, it also demanded a completely new outfit. But while to wear a suit of clothes twice would defile the emperor, the representative of the gods, it was likely to bring special heavenly blessings to anyone of noble birth wearing it. So Moctezuma's cast-off clothing was eagerly sought and proudly worn by the highest nobility in the empire. In Peru it was taboo to make the vessels of the temple of the sun in the capital of any other material than gold whose shining color represented the radiant face of the deity; while all the furnishings of the moon goddess were required to be of silver. This latter example well illustrates the extreme growth of naturalistic ideas from commonplace, natural associations to taboo of the most rigid sacred character. About these nature tabooes grew up many legends to account for them or to explain them. The Peruvians asserted that gold was formed from the tears of the sun god; the Mixtecas declared that it was the sacred excrement from his shining body. The Colombian Indians in the neighborhood of Bogotá inaugurated their new emperor into office by painting his naked body completely with gold dust, thus symbolizing that he was the direct representative of the sun, the great racial father upon earth. Such complicated ceremonies with their rigid, uncompromising tabooes, imply a long-developed civilization or culture built upon nature worship.

The Nature Gods.— Nature worship, which, as has already been said, had its origin in the fear of the destructive forces of nature and a desire to placate them, or in respect for virile qualities in the same, grew in time, as man became more civil in his habits, to be a very complicated institution. Under the Aztecs, Mayas, Quiches, Zapotecas, Mixtecas, Pueblo Indians and Peruvians in America and among the great civilized nations of Europe, northern Africa and southern and western Asia, in the pre-Christian era, nature worship had become organized, in each case, into a most complicated religio-philosophical system which defined the attributes and sphere of action of each of the deities and explained his relationship to the gods as a whole, to the state, to the priesthood, to the nobility and to the masses. This called for an extensive classification and cataloguing of the nature deities. This had already taken place in the religious systems of all the great civilized nations in pre-Christian days. Naturally, under such a system, where almost every phase of animate nature was represented by its special deity, the list of the gods became very great. Yet they all came under a few primary divisions. The upper religions were occupied by the sun, moon and other planets, by the dawn and the darkness, the clouds, the thunder and the lightning, the winds of the four quarters of the heavens and their accompanying night spirits or wind spirits. In most nature religions these regions were divided into the upper heavens, inhabited by the sun, moon, planets and gods of dawn and darkness; and the lower heavens, the home of the clouds, winds, rain gods and other deities of the elements. The earth was the home of the deities of growth and fertility and the general habitat of the household penates and guardian spirits; while the regions within the earth or beyond the borders of the natural world, that is out on the great elemental ocean which, in most mythologies, surrounded the earth, were the regions of death and decay. Within the earth, too, quite frequently were the regions of birth. These ideas and divisions sprang naturally out of nature worship. At death all things go back into the earth; at birth all the vegetable kingdom evidently comes out of it. This was one of the patent facts that first appealed to the imagination of myth-making primitive man. There was a tendency to divide the deities of these divine regions into beneficent and malevolent beings. Thus arose the idea of the warring of the nature gods.

The Functions of the Gods.— Nature worship, originating independently, as it undoubtedly did, in different quarters of the world, naturally developed along different lines among people racially and linguistically different. But as the origin of the pantheistic conceptions that distinguished it were essentially the same, there is a striking similarity in the functions and attributes of the nature gods everywhere. The earth, which gives birth to all things, is the universal mother; the sky, which sends the fructifying rains, is the husband of the earth and the great nature father. The sun, with his vivifying rays is the father of growth. The winds, with their ceaseless movements and their great speed, become the messengers of the gods, the bringers of culture and the purifiers or healers. But there are beneficent winds and harmful winds, gentle winds and destructive winds. Those working in the interest of man are represented as in a constant struggle with those seeking to harm him. This feature of nature worship is strongly evident in many myths. In the Mexican mythology Quetzalcoatl, the beneficent east wind is represented as the culture hero struggling with Tetzcatlipoca, the black spirit of the night, or the night wind. Hiawatha fought and defeated the Great Pearl Feather, the wind that broods over the pestilential marshes; and he fought his own father Mudjikierwis, the west wind and the father of all the winds of heaven, who finally shares his kingdom with him, making him the Keewatin, the northwest wind, the home wind.

The Serpent in Nature Worship.— Everywhere the serpent drags its tortuous length through the habitat of the nature gods. Many explanations of its presence there have been presented by students of mythology, but most of these explanations have been unfortunately fanciful or manufactured to fit preconceived theories. The serpent is inseparably associated with the wind gods. Sometimes, he is a kindly deity; at others he is the spirit of malevolence. This is a natural development of nature and in no way demands a supernatural explanation since it fits in with the nature of the winds. Quetzalcoatl (q.v.), the great culture hero of Mexico, Yucatan and Guatemala, was represented as a plumed serpent, and the serpent formed the most conspicuous decoration of his temples. Yet others of the Mexican wind gods also bore the sign of the serpent. The robe of the mother of the gods was represented as consisting of interwoven snakes. The serpent was frequently intimately connected with the deities of fruition and birth, probably because the wind gods were also thus connected. But the destroying force was also represented as a winged serpent in many parts of the world. This is but another form of the evil wind. This latter conception gave birth to the dragons of destruction bearing with them fire or lightning as their destroying agents. From this conception to that of the evil one, the old serpent, the personified force of evil as found in the Persian and other related religions, is but a step. Christianity and the Hebrew faith borrowing the imagery of the nature religions have made it vividly familiar to us.

In Roman and Greek mythologies, the gods of healing are associated with the serpent and not the least of these is Apollo. This association of the serpent with the gods of birth and healing explains their relationship to public worship which has produced so much discussion and investigation and has given birth to the so-called theory of serpent worship. With the Chinese, as with the Toltecs, the wind god (in the case of the Chinese in the shape of a dragon) became a sort of world divinity, the great wisdom, the universal benefactor. As the fructifying rain bringer, the serpent represented kindly forces; as the rain preventer his tendencies were evil.

The Cross in Mythology.— Throughout all primitive America and in many of the mythologies of the eastern hemisphere the world was divided into four quarters over which ruled one of the winds, all of which were frequently represented as so many serpents or dragons. Quetzalcoatl, the Toltec culture god, sailed away to the unknown land on a raft of snakes, or in a boat moved by supernatural serpents, which were at once symbolical of his origin as a wind god and his office as the greatest culture hero of the American races and the symbol of divine wisdom and earthly progress. Being the symbol of fertility, the serpent naturally became that of the so-called pallic worship which was also symbolized by the cross, as the representative of the four quarters of the earth in which lived the winds and the rain gods. In pre-Columbian times the cross was the symbolical representation of the activity of the winds as the bearers of fertility throughout Mexico, most of Central America and the Pueblo and some other Indians of the United States. In the form of the swastika (the four-footed cross with the ends bent, generally at right angles), the cross became the symbol of good fortune and (among the American Indians) of generation. The Cretan mother goddess, the great deity of fertility, is represented, in her surviving statues, with snakes coiled about her waist and arms; and she was worshiped in the temple of the sacred cross. Throughout Crete, where her worship seems to have had a very important place, the cross was looked upon as a sacred symbol. Like the rain gods of Mexico and Central America, the mother god of Crete was worshiped on the tops of the hills and the high places from whence descended the fructifying waters. Like the tlalocks and other gods of the rain cross she was connected with death and life, more especially the latter. In the course of time the cross, especially in America, came to form a very important part of the decoration of temples and sacred places in pre-Columbian days. The trail of the cross, like the trail of the serpent, runs across Mexico and Central America and a very considerable part of the United States.

Fire.— Along with sunshine, rain, air in motion and regeneration, fire early became for man one of the sacred elements. To him it symbolized (among many races) the sun, the great generator and the source of all heat. By the use of fire it was possible for him to greatly enlarge his range of diet, to fell the huge forest trees and shape his canoes from them.

It enabled him to shatter great masses of rock and to shape them roughly to his ends. Later on it enabled him to smelt metals and to attach them to his car of progress. As it was hurled from the cloud it became symbolical of the power that hurled it. As it was vomited forth from the volcanoes, it came to signify the titanic forces of the underworld and became inseparably connected with punishment for offenses connected with the infernal regions, in various mythologies. From these primitive beliefs later religious systems borrowed much of their systematized ideas of the nature of future punishment.

The Future Life.—As the beneficent beings who brought their favors to the earth occupied the upper air; and as there, too, is the home of the sun, the moon and the planets which were supposed to strongly influence human life for good or evil, very many races looked upon these regions as the home of their future life. Some beliefs held that the souls of the dead went to the sun, others to the moon, still others to the great cloud land, a mid-region between the earth and the home of the superior deities. Some races placed the future world in the far north or northwest, in the region of the northern lights, whose brilliancy probably suggested the idea. Among many Indian tribes the rainbow was believed to be the bridge that spanned the great gulf separating the earth ocean and the sky ocean. Numerous other American tribes believed that the dead went to some great underground region. But all the nature religions presented the future life as essentially the same as that upon earth though surrounded by happier, because more fortunate conditions. Communication was not only possible between the earth and the future world but the rainbow bridge had been climbed or the great gulf had been frequently crossed in the magic stone canoe by the mortal heroes of nearly every United States Indian tribe. Some legends depict the tribal hero as scaling the heights of heaven on the back of a great bird, or in the wicker-car of the star or sun-maidens or in numerous other manners; for to the nature worshiper the universe was one great whole, the parts of which were not essentially different from one another.

Theories of Nature Worship.—At the head of the early naturalistic school is Max Müller. He maintains, with the disciples of his school, that the worship of nature was the primary religious efforts of man; and he attempts to prove his position by means of comparative mythology. His theory, which applied only to the Indo-European races, was carried to an absurd limit by many of his school. E. B. Tylor looks upon the worship of the dead as the earliest of human cults and Herbert Spencer takes the same ground. The latter derives from this source all other forms of worship. Tylor traces the history of the so-called animistic faith, while Spencer displays its evolution. Wundt maintains that religion finds its origin in the primitive belief in human souls and in an early animism out of which a belief in magic and fetishism grew. Dunkheim believes that the totemic principle, or belief in mysterious power (the mana or magic power) is the source of all religion. All of these investigators have hit upon certain important truths, but no one of them has been able to grasp the significance of the wide field of mythology, for they all have made categorical statements upon which they have built up elaborate theories.

Bibliography.— Brinton, D. G., ‹Myths of the New World› (Philadelphia 1896); Buckland, A. W., ‹Anthropological Studies› (London 1891); Chantepie, de la Saussaye, P. D., ‹Lehrbuch der Religionsgeschichte› (Freiburg 1887); Crooke, W., ‹Popular Religion and Folklore of Northern India› (London 1896); Durkheim, Emile, ‹La vie religieuse› (Paris 1912); Fergusson, J., ‹Rude Stone Monuments› (London 1872); Frazer, J. G., ‹The Golden Bough› (London 1907–13); Goblet d'Alviella, E., ‹La Migration des symboles› (Paris 1891); Jastrow, M., ‹Religion of Babylonia and Assyria› (Boston 1898); Lang, A., ‹Custom and Myth› (1884); ‹Myth, Ritual and Religion› (1899); ‹The Making of Religion› (1898); Lefevre, A., ‹La religion› (Paris 1892); Moorehead, W. K., ‹Primitive Man in Ohio› (New York 1892); Müller, M., ‹Natural Religion› (London 1898); Sayce, A. H., ‹Religion of Ancient Egypt and Babylonia› (Edinburgh 1902); Spencer, ‹Principles of Sociology› (1876); Tylor, E. B., ‹Primitive Culture› (Boston 1903); Waring, ‹Forms of Solar and Nature Worship› (London 1874); Wundt, W., ‹Volkerpsychologie, Mythus und Religion.›

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NAUCRATIS, nâ'kră-tĭs, Egypt, an ancient Greek colony, the remains of which are near Nebîreh, 50 miles by rail southeast of Alexandria. It existed as early as the beginning of the 7th century B.C., and was approached by a navigable canal in the western part of the Delta, near the Canopic branch of the Nile. Its chief period of splendor was during the reign of Amasis II, 570–520 B.C., under whom it was recognized as the official capital of the Greeks in Egypt. Its site was rediscovered in 1884 by Prof. Flinders Petrie. Subsequent excavations have uncovered the remains of buildings described by Herodotus, the Hellenium, temples to Apollo, Aphrodite, the Dioscuri, etc., and there have been valuable finds of early Greek pottery and other archæological treasures. Consult Petrie, W. M. F., ‹Naucratis› (1886); Gardner, E. A., ‹Naukratis II› (in Egyptian Exploration Fund, *Publications,* Vols. III, VI, London 1886–88); Hogarth, in British School at Athens, *Annual* (ib. 1898–99); id., ‹Naukratis, 1903› (in *Journal of Hellenic Studies,* Vol. XXV, ib. 1905).

NAUCYDES, nâ-sī'dēz, Greek sculptor. He flourished in the first quarter of the 4th century B.C. His birthplace was Argos and he was the pupil of the Elder Polycletus of the Peloponnesian school of sculpture. He carved a chryselephantine statue of Hebe for the temple of Hecate at Argos; a bronze statue of Hecate; a Hermes; several statues of Victory; a portrait of the poetess Erinna; ‹Phryxus Sacrificing the Ram› (for the acropolis at Athens), and a Discobolus. The younger Polycletus was his pupil.

NAUGATUCK, Conn., town and borough in New Haven County, on the Naugatuck River, and on a division of the New York, New Haven and Hartford Railroad, about 40 miles south by west of Hartford and 25 miles northwest of New Haven. In 1844 it was incorporated as a town and as a borough in 1893. The chief manufactures are rubber goods, paper boxes, knit goods and machine-shop products. It has considerable trade in farm products. It has the largest plant for reclaiming old rubber in the world, also a very large factory for the production of heavy acids used in the brass and rubber industries, and a large chemical plant for the production of chemicals formerly imported. It is well supplied with schools; it has besides the public and parish elementary schools, the Whittemore High School, the Salem School, Saint Francis Academy (R. C.) and the Whittemore Memorial Library. The government is vested in a board of wardens and burgesses, who hold office one year, and who appoint all the administrative officials except the board of education, the members of which are chosen by popular vote. Pop. 15,000.

NAUGATUCK, nâ'gą-tŭk, a river in Connecticut, has its rise in the northern part of Litchfield County and flows south, about 60 miles, and enters Housatonic River at Derby. It flows through a mountainous part of the State and supplies water power to many mills and factories. Waterbury is the chief city on its banks.

NAUHEIM, nou'hīm, Germany, town near Frankfort-on-the-Main, in province of Oberhessen, on the Usa, at the northeast foot of the Taunus, and on the Cassel-Frankfort State Railway. It is world renowned for its saline baths, where the visitors are afforded a magnificent Kurhaus, Inhalatorium, extensive park elaborately laid out, etc. Here are three Evangelical, a Catholic and an Anglican church, synagogues, a high school, etc. The medicinal waters are rich in iron, table-salt and carbonic acid, and are, therefore, available for drinking as well as bathing, and for export, and are used in cases of rheumatism, disease of the spinal marrow, gout, obesity and feminine troubles, and especially for diseases of the heart. Before the World War this was one of the most popular bath resorts in Europe, attracting as many as 34,000 patients per annum. Pop. 5,694.

NAULETTE, nō-lĕt', a large cavern in Belgium, near Dinant on the Lesse in the commune of Furfooz. Here, in 1866, was found the lower jaw of a human, together with the bones of the elephant and rhinoceros. The human remains were assigned to the Mousterian epoch.

NAUMACHIA, nä-mā'kĭ-ą, or **NAUMACHY** (from the Greek *naus,* a ship, and *machē,* a fight), among the Romans a public spectacle, representing a naval action. Cæsar was the first who exhibited a spectacle of this sort, which soon became the favorite amusement of the Roman people. Buildings were erected by the emperors, specially adapted for the purpose. They resembled the amphitheatres, and like them were at first built of wood. Domitian erected one of stone. A *naumachia,* built by Augustus, was 1,800 feet long and 200 wide, and was capable of containing 50 ships with three banks of oars, besides many small vessels. They were suddenly laid under water by means of subterranean canals, so that the ships were raised at once from the dry floor before the eyes of the spectators. These sea-fights were exhibited with the same splendor and reckless disregard of human life which characterized the gladiatorial combats. Titus exhibited a sea-fight in which 3,000 men were engaged and ships almost equal in number to two real fleets were shown in combat by Domitian. The crews generally consisted of gladiators, prisoners or condemned criminals.

NAUMANN, now'män, **Johann Friedrich,** German ornithologist: b. Ziebigk, Germany, 14 Feb. 1780; d. there, 15 Aug. 1857. He studied with his father, who was an ornithologist, and became professor and inspector at the Ornithological Museum of the Duke of Annalt-Köthen. His most valuable contribution to the science of ornithology is the 'Naturgeschichte der Vögel Deutschlands' ('Natural History of the Birds of Germany'), published in 1822–24; he prepared the illustrations for this work, making the plates for more than 500 copper engravings. He also wrote 'Taxidermie' (1815); 'Über den Haushalt der nördlichen Seevögel Europas' (1824); and, with Buhle, 'Die Eier der Vögel Deutschlands und der benachbarten Länder' (1819–28). A statue of him was erected at Köthen in 1880, and the German Ornithological Society named its official organ in his honor, *Naumannia.*

NAUMANN, Johann Gottlieb, German composer: b. Blasewitz, near Dresden, 17 April 1741; d. Dresden, 23 Oct. 1801. Thanks to the interest of a rich Swedish amateur, Weeström, he was taken to Italy when 16, and there studied under Tartini. He became court composer at Dresden in 1765, and kapellmeister in 1774, a post to which he returned in 1786, after six years in Stockholm, where he organized the royal orchestra. His music, including operas, oratories and symphonies, was essentially Italian in style and is no longer popular. Consult the biography by Nestler (1901).

NAUMANN, Karl Friedrich, son of J. G. Naumann (q.v.), German mineralogist: b. Dresden, 30 May 1797; d. there, 26 Nov. 1873. He was educated at Freiburg, Jena and Leipzig, and in 1821 made a scientific tour in Norway. He was an instructor in the University of Jena in 1823 and professor at Leipzig in 1826. From 1826 to 1842 he was professor of crystallography at Freiburg, and from 1842 till shortly before his death held a professorship at Leipzig. Among his works are 'Anfangsgründe der Krystallographie' (2d ed., 1854); 'Elemente der Mineralogie' (12th ed., 1885).

NAUMANNITE, *in mineralogy,* is the name given to a native selenide of silver and lead found in the Harz Mountains and so called from K. F. Naumann (q.v.). This mineral contains about 26 per cent of selenium, 65 per cent of silver and 6 per cent of lead; in some samples a great part of the silver is replaced by lead. Specific gravity about 8.0. Color and streak iron-black.

NAUMBURG, nowm'boorg, or **NAUMBURG-ON-THE-SAALE,** zä'lĕ, Germany, a town of the Prussian province of Saxony, on the Saale, near the junction of the Unstrut, 28 miles southwest of Halle. Its chief edifice is the restored cathedral, which has four lofty towers, one the gift of William II, erected in 1894. The town has some manufactures and a considerable wine trade. Glass and porcelain painting is also an extensive industry. It became an episcopal see in 1029. In the 15th and 16th centuries several treaties were concluded at Naumburg, and the town was of great strategical importance during the Thirty Years' War and the wars of 1806 and 1813. Pop. 26,962.

NAUPLIA, nâ'plĭ-ạ, Greece, a fortified seaport town, capital of the monarchy of Argolis, at the north extremity of the Gulf of Argos, 25 miles by rail south of Corinth. It was occupied by the Venetians in the 13th century and was taken by the Turks in 1540. From 1824 to 1835 it was the capital of Greece, but declined in importance after the removal of the court to Athens. It is of some importance commercially because of its fine harbors. Pop. about 15,000.

NAUPLIUS, nâ'plĭ-ŭs, in Greek mythology, the son of Neptune and father of Palamedes. He is said to have revenged the death of his son by deceiving the Greeks by false beacons, as they returned from Troy, and causing their vessels to be wrecked.

NAUPLIUS. See Larva.

NAUSEA (Latin from Greek *ναυσια*, seasickness), a sensation of sickness and distress, of which the leading characteristic is squeamishness of the stomach. The disturbance, however, extends to the entire system. In severe cases languor affects every part; the pulse is small; the skin moist and pale; the flow of saliva increases, and if vomiting does not immediately accompany the sensation the apprehension of it is painfully present. The causes of nausea are many: blows upon sensitive parts, mental shocks, hysteria, pregnancy, irritation or tumors of the abdominal or the pelvic viscera may produce it, as may also the early stage of zymotic disease or epilepsy, diseases of the brain, etc. See Vomiting.

NAUSHON, nâ-shŏn', the largest of the Elizabeth Islands (q.v.), off the southeast coast of Massachusetts.

NAUTCH, näch, in India, a dance performed by the dancing girls attached to the temples, called Nautch girls or Nautchee, who are brought up and trained to all the arts and allurements of their profession. It is probably a survival of the ancient custom of sacred prostitution. They move with slow, undulatory movements of the body, while the feet are but little used. They correspond to the bayaderes (q.v.) of the south of India.

NAUTICAL SURVEYING. See Hydrography; Surveying.

NAUTICAL TRAINING SCHOOLS. Schools for training young men in the science of navigation, in the study of marine engineering in all its various branches, in practical seamanship — in all the necessary matters pertaining to the operation of vessels at sea, have long been established both in the United States and in foreign countries. These nautical schools have for their definite object the training of young men who desire to follow the sea as a profession, to enable them to become officers in the Merchant Service and to provide highly trained, efficient officers for the auxiliaries and reserve of the naval forces. European countries, especially England, France and Belgium, have for many years conducted successfully such institutions. In the last few years Japan, Brazil and the Argentine republic have also developed institutions for this purpose.

In the United States, although there have been but three practical nautical schools for this purpose, viz., the New York State Nautical School, the Massachusetts Nautical School and the Pennsylvania Nautical School, they were all of very high order. The schools were maintained on sea-going vessels, usually all sail-rigged with auxiliary power. The course embraced two years and included cruising to foreign waters. During the winter time. when the school-ships were moored at the wharves, theoretical instructions were given and the routine was somewhat similar to a school ashore, but during the summer months practical training under actual conditions prevailing at sea was given and every operation of the ship was combined with intensive study for the purpose of enabling the cadets to obtain proficiency.

Upon graduation from either the New York State Nautical School or the Massachusetts Nautical School (the Pennsylvania Nautical School having been discontinued some few years back) the cadet is entitled to apply for a third officer's or third assistant engineer's certificate. After three months' service at sea he can obtain a second officer's license; after another year's service as second officer on deck he can get his license as first officer, and a year thereafter he can qualify for his master's license.

The coming development of the American Merchant Marine will necessitate an expansion of the nautical school idea in order to enable it to meet the demand for trained personnel. During the war emergency dire necessity caused the Shipping Board to inaugurate emergency schools for the hasty training of officers and engineers, which at the time served to meet the paralyzing deficiency then existent. The Shipping Board schools provided for three months' study, and could in no way be compared to the thoroughness of the education provided by such institutions as, for instance, the New York State Nautical School, which latter has been in existence since 1876.

The success of the New York State Nautical School, as well as the Massachusetts Nautical School, as reflected by services rendered by their graduates in all branches of the Merchant and Naval Service during the World War has impelled, among others, the States of Oregon, California and Maine to establish similar schools to be maintained by the various States.

The Federal government contributes toward the maintenance of the schools by an appropriation granted to reimburse the State in part for the expense of maintaining the school and by loaning suitable vessels, and also, when possible, designating naval officers as instructors. It is hoped that within a short time the Federal government will take a larger interest in this very vital question.

The opportunities thus presented to young men between the ages of 16 and 20, who enter these institutions, who can obtain their licenses as third officers at the age of 19 and who in time of war obtain commissions in the Naval Reserve Force when they reach the age of 21, are unlimited; numbers of young men have risen to command of ocean-going ships within a period of eight years.

Louis Weickum,
Secretary, New York State Nautical School.

NAUTILUS, a marine cephalopod of the genus *Nautilus* and family *Nautilidæ*, a few living species of which are the only survivors of the order or superorder *Tetrabranchiata*, which including both the nautiloid forms and the ammonites (q.v.) is divided into no less than 22 extinct families, so abundant were they in past ages. The nautiloids began in the Cambrian, became greatly differentiated and abundant in the Silurian and Carboniferous, and by the close of the Palæozoic Age had become almost entirely extinct. The more complex ammonites, on the other hand, reached their full development only during the Mesozoic Age. The shell of the pearly or chambered nautilus, described below, is typical of the armature of the group. It is at first simple, but as the animal grows becomes coiled in a flat spiral and divided by internal transverse septa into a succession of chambers, the last one of which is occupied by the animal. This process is continued until about 36 chambers have been formed, all but the last filled with gas which gives a certain buoyancy, but does not enable the animal to come to the surface. Externally the shell is porcellaneous; internally is a layer of mother-of-pearl. The septa are perforated by an opening, through which a membranous tube or siphuncle passes from the posterior end of the animal to the apical or first chamber of the spire. Among other anatomical peculiarities the animal has four gills and four kidneys, calcareous instead of horny beaks, a funnel composed of two lobes instead of one tube, small stalked imperfect eyes and no ink bag. Quite unique are the tentacles, which number about 90. On each side of the head are a hood tentacle, two ocular tentacles and 17 brachial tentacles, and around the mouth four groups of 12 or 13 labial tentacles.

The best-known species is *Nautilus pompilius* which, with two others, inhabit the Indian Ocean and tropical parts of the south Pacific. They live exclusively on or near the bottom in relatively deep waters, are gregarious, more or less migratory and nocturnal. Although fond of any animal matter, they feed chiefly on prawns. In swimming they dart quickly backward for short distances, with the tentacles either radiating or held together and stiffly projecting from the mouth of the shell; but they are inactive and rest most of the time on the bottom. Little is known of their breeding, which is supposed to take place in deep holes. The eggs are very large; including the capsule they measure nearly one and a half by three-fourth inches. They are attached singly by the base, and the capsule is irregularly folded and fenestrated longitudinally in a most peculiar manner. This species is very abundant in about 60 fathoms of water in the Philippines, and large numbers are captured by the fishermen in bamboo fish traps or baskets constructed on the principle of the lobster pots in use on the New England coast and baited with any kind of animal offal. The shells are somewhat used in the arts, but the flesh is little esteemed for food, as is that of the native species by the

Fiji Islanders. Consult Willey, ‹Zoological Results› (Part VI, Cambridge 1902), and Lacaze-Duthier, ‹Arch. Zoologie Experimentale› (1892).

The «paper nautilus» is a very different animal, for which see ARGONAUT.

NAUTILUS, in hydraulic engineering, a diving-bell (q.v.) requiring no suspension. Water admitted through the cock into pipes flows into the exterior chambers, causing the apparatus to sink. The workmen enter through an aperture at the top, closed bv an air-tight cover, and can in still water move the machine in any required direction by stepping on the ground and pushing. Air is condensed in a reservoir at the surface to a degree somewhat greater than the condensation due to the depth, and passes through a pipe into the chambers rendering the machine specifically lighter than water and enabling it to lift stones or other objects below. A gauge indicates the amount of lifting power attained as the air is admitted.

NAUVOO, na-voo′, Ill., city in Hancock County, on the Mississippi River, about 30 miles below Burlington, Iowa. It is situated in an agricultural and fruit-growing region in which grapes and berries are the chief products. The principal industries are connected with the manufacturing of wine and the shipping of wine and fruits. It is the seat of Saint Mary's Academy (R. C.). Nauvoo was founded by the Mormons (q.v.) in 1840, and in 1846 it had a population of 15,000. It had mills, factories, stores, schools, etc. Its most conspicuous building was a temple built of white limestone, 130 feet long and 90 feet wide. The temple was not completed when the Mormons were expelled in 1846; in 1848 it was partially destroyed by fire, and in 1850 it was further ruined by a tornado. A company of French Socialists, called Icarians, took possession of Nauvoo in 1850 and remained until 1857. The «Nauvoo Legion,» a Mormon military organization, which embraced all the boys and men between the ages of 16 and 50, was founded here in 1840, and in 1857 was reorganized in Utah. At the last muster, in 1870, it had a membership of 13,000. Pop. 1,020.

NAVA, nä′nä, a seaport of Japan. See NAFA.

NAVAJO (năv′a̤-hō) **CHURCH.** This name is given to a remarkable spire of white sandstone rising from the top of the red cliffs just west of the continental divide a short distance east of Gallup, N. Mex. It is visible for several miles from Santa Fé Railroad near Wingate station.

NAVAJO INDIANS. An important tribe of the Athapascan stock of Indians, now on a reservation of about 9,503,763 acres in northeastern Arizona, northwestern New Mexico and southeastern Utah, at an average elevation of 6,000 feet above sea-level. According to Fray Alonso Benavides (1630), the word «Navajo» means «sementeras grandes,» «great planted fields,» and the name was never applied to the Navajo by themselves, their own tribal designation being «Dine.» There is no evidence that the Navajos were seen by the Spanish explorers of the Southwest in the 16th century, although the latter passed through their present territory in 1540, 1583 and 1598; it is therefore believed that at this early period they were an insignificant agricultural tribe, but gradually increased in population largely through the adoption of natives of both allied and other stocks during succeeding years. Their territory is entirely within the arid region and their lands are chiefly desert; but in the cañons and about the bases of the mesas that abound in their territory, horticulture is practised through deep planting in the sandy soil, while in the valley of the Rio San Juan, which is the largest stream in their country, farming is carried on to a greater extent. Agriculture, however, forms but a meagre part of the Navajo's subsistence, his livelihood being gained principally from the flocks and herds, of which, in 1902, there were 380,000 sheep and 67,000 goats, the former of which, besides furnishing the chief food supply, netted $150,000 in wool and blankets. These blankets, which have become celebrated, are woven by the women on simple looms and in pleasing and sometimes intricate designs of various colors. Formerly native dyes of rare delicacy of tone were employed, but in recent years these have given way to glaring aniline colors, and the decorative patterns have also been largely modified to meet the demands of the white man, so that as specimens of aboriginal handiwork very few of the Navajo blankets now woven are comparable with those formerly made. The Navajos also weave belts, garters and saddle-girths, and make a few excellent baskets, mostly for ceremonial use. Some of the men are expert silversmiths.

Although more closely related in language to the Apaches than to any other tribe, the Navajos are greatly mixed, embodying elements of Pueblo, Shoshonean, Yuman and even of Spanish blood; hence there is perhaps a greater variety in their physical features than among most Indian tribes.

The typical Navajo dwelling is a conical framework of logs or sticks covered with brush, bark or grass, and earth, with a smoke-hole at the apex and a doorway in one side. Rude shelters with open fronts are erected for use in summer. If a person dies in a house the latter is believed to become haunted and is henceforth tabooed.

Dr. Washington Matthews, United States army, who has studied the inner life of the tribe, discovered the existence of 51 clans, grouped into about a dozen phratries, which latter, however, are probably not homogeneous organizations as among some Indians. A Navajo belongs to the clan of his mother, and a man may not marry a woman belonging to his own clan; or, as a rule, one of his own phratry. The religion of the Navajo is elaborate and complicated. They have a great many ceremonies, most of which are performed for healing the sick, but others are conducted to ensure success in planting, harvesting, building, war, nubility, marriage, travel and for bringing rain. Sacrifice, elaborate dry paintings with sand and pigments, masquerade, dancing, prayer and song are the elements of the ceremonies, the gods being personated by the masked performers.

Almost from the beginning of the 17th century the Navajos were enemies of the sedentary tribes and of the Spanish colonists, and although they were never so predatory and warlike as their Apache cousins, the Spanish villages and

Pueblo settlements suffered almost continuously from their raids up to the time of the conquest of New Mexico by American forces in 1846, followed by the establishment of military posts throughout the Southwest. Treaties were made with the tribe in 1846, 1848 and 1849, but they were of no avail in keeping in check their depredations, which continued at intervals until 1858, expeditions meanwhile being led against them. In the year last named the Navajos killed a negro servant at Fort Defiance, as a direct result of which it became necessary to wage warfare against the Indians from August until December, during which 50 Navajos were killed and a large number of sheep and other stock lost. Another treaty was signed, but during 1860 the depredations continued, and another expedition was led against them, but without success. In April the natives boldly attacked Fort Defiance, but were repulsed. In the winter of 1860–61 an active campaign was made against them, and although practically their only loss was in sheep, they were compelled to sue for peace in February 1861, when an armistice of a year was agreed to, during which the troops were withdrawn. In a dispute over a horserace at Fort Fauntleroy (near the present Fort Wingate), New Mexico, a dozen Navajos were brutally killed. Emboldened by the withdrawal of the troops on account of the Civil War, the Indians resumed their raids, which they continued almost uninterruptedly until 1863, when Col. Christopher («Kit») Carson began operations against them and a plan was formulated to transfer the Navajos from their old haunts to Fort Sumner, at the Bosque Redondo, on the Pecos River, in eastern New Mexico. It was determined that all who refused to go after 20 July would be regarded as hostile and be treated accordingly, yet by the close of the year only 200 prisoners were at Fort Sumner or on the way thither. Early in 1864 Carson made a campaign to the Cañon de Chelly, in the heart of the Navajo country in northeastern Arizona, where he killed 23 and captured over 200 of the Indians. This taught the latter a lesson, so that by the close of 1864 more than 7,000 of the tribe were held as prisoners at the Bosque Redondo. These were increased to 8,491 in 1865, but it was supposed that this number did not represent more than half of the tribe. The experiment, however, proved a failure, so that after the death of about a thousand of the Indians, the escape of others and an expenditure of about a million dollars in their support in a region ill-adapted to their progress, the remainder, numbering 7,304, were removed to their old country in July 1868, an appropriation of $422,000 having been made in that year to give them a new start. Since that time the Navajos have been peaceable and industrious. They make good laborers and are slowly developing agricultural pursuits. In 1902 they had 8,000 acres under cultivation, which yielded 1,200 bushels of wheat, 700 bushels of oats, etc., and 3,000 bushels of corn. They earned in addition a quarter of a million dollars by the product of their labor, and besides the sheep and goats above mentioned owned 47,260 horses, mules and burros, and 8,000 cattle. There are also four sectarian missions and two mission schools on or near the reservation. In 1890 a partial census showed 17,204 Navajos; that of 1900, over 20,000; and a rough estimate of the Indian office in 1906, over 28,500. Since then the tribe is believed to have increased.

Bibliography.— Hollister, 'The Navajo and his Blanket' (1903); Hrdlička, 'Observations on the Navajo' (*American Anthropologist*, Vol. II, 1900); Hughes, J. T., 'Doniphan's Expedition' (Cincinnati 1848); James, G. W., 'Indian Blankets and their Makers' (Chicago 1914); Lipps, O. H., 'The Navajos' (Cedar Rapids, Iowa, 1909); Mathews, C., 'The Indian Fairy Book' (New York 1856); Matthews, W., 'The Night Chant' (New York 1902); 'Navajo Legends' (New York 1897); 'Navajo Myths, Prayers and Songs' (Berkeley 1907); 'A Two-faced Navajo Blanket' (*American Anthropologist*, Vol. II, 1900); Mindeleff, 'Navajo Houses' (Report, Bureau of American Ethnology 1901). Consult also 'Handbook of American Indians North of Mexico' (Bureau of American Ethnology, Bulletin 30, Washington 1910).

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NAVAJO MOUNTAIN. A prominent peak rising high above the Arizona Plateau in the extreme southern part of San Juan County, Utah. Its altitude is 10,416 feet. It has rarely been ascended by white men. It is a short distance south of the rim of Glen Canyon of the Colorado River and from its summit a great view is obtained of the upper part of the Grand Canyon region, the Henry Mountains, the Vermilion Cliffs and other features of the high plateaus. It is forest clad, several springs issue from its sides and in its north slope are the great Rainbow and Owl natural bridges. The mountain is due to a dome-shaped uplift of the sedimentary rocks and the top is capped by Dakota sandstone. Consult Gregory, H. E. (in United States Geological Survey, Water Supply Paper 380, and professional paper 93).

NAVAL ACADEMY, United States, the most important naval school in America, established at Annapolis, Md., in 1845, by a special act of the Congress. The origin of this technical educational institution was due primarily to the efforts of George Bancroft, Secretary of the Navy. The academy was opened 10 Oct. 1845, with Commander Franklin Buchanan as superintendent. For a time during the Civil War the school was removed from Annapolis to Newport, R. I. The Bureau of Navigation of the Navy Department has direct supervision of the academy.

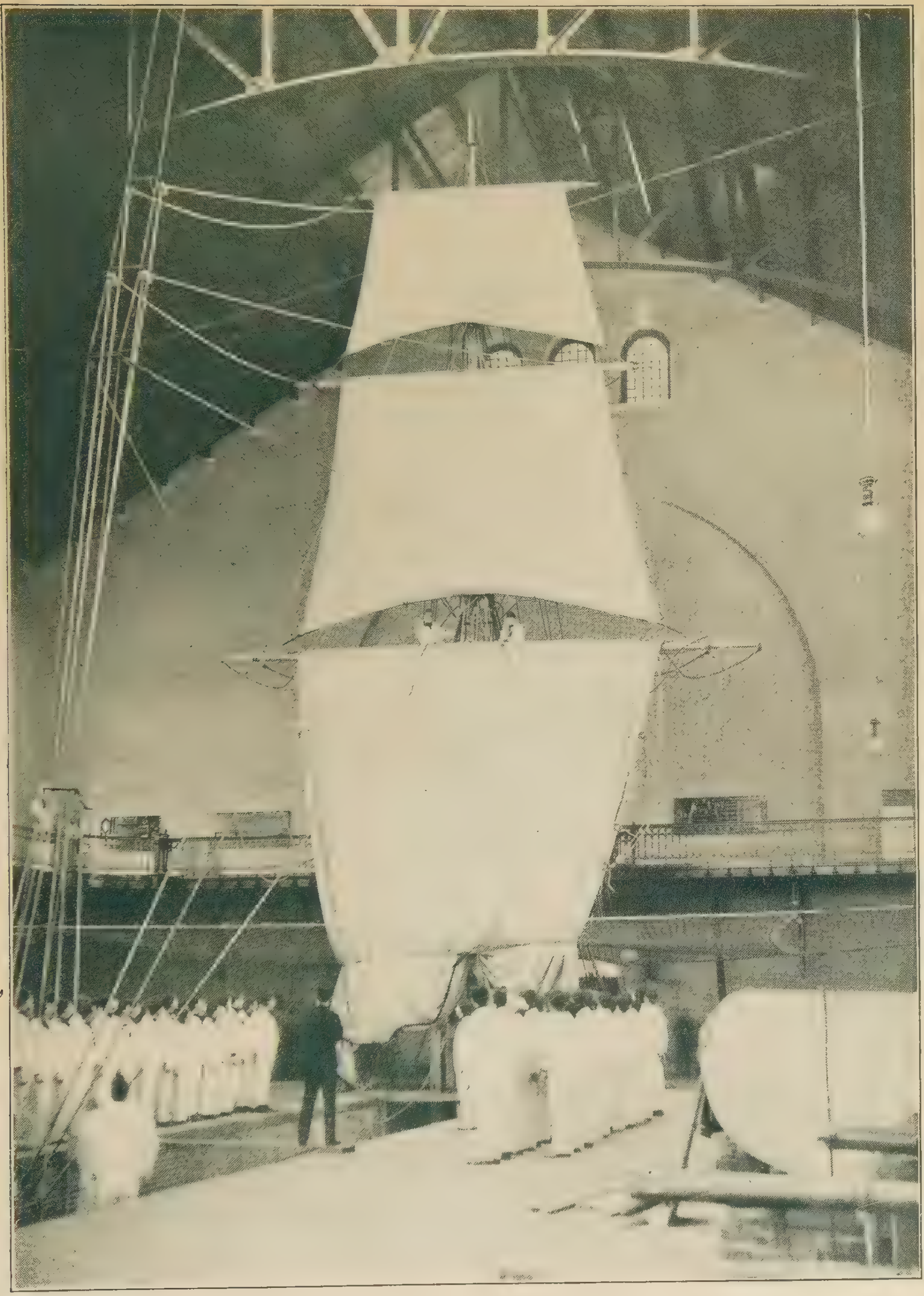
Admission of Students.—There are received at the academy three midshipmen for each senator, member or delegate of the United States House of Representatives, two for the District of Columbia and 15 at large. The appointment of midshipmen at large and for the District of Columbia is made by the President. In addition to the above the law authorizes the appointment of 25 enlisted men each year to be selected as a result of a competitive examination of enlisted men of the navy and marine corps who have been in the service at least one year and who are under 20 years of age by 15 August of the year it is desired to enter. The mental and physical requirements for these candidates are the same as for other candidates for midshipmen. One midshipman is also allowed from Porto Rico, who must be a native of that island. The appointment is made by the President on the recommendation of the governor of Porto Rico. The Secretary of the navy, as soon after 1 June in each year as possible, must notify in writing each senator, representative and delegate in Congress of any vacancy that may exist in his district. The nomination of a candidate to fill the vacancy is made on the recommendation of the member or delegate by the secretary Candidates must be actual residents of the districts from which they are nominated. They enter the academy immediately after passing the prescribed examinations and are required to sign articles binding themselves to serve in the United States navy eight years (including the time of probation at the Naval Academy), unless sooner discharged. All candidates are required to be citizens of the United States and must at the time of their examination for admission be between the ages of 16 and 20 years. A candidate is eligible for examination on the day he becomes 16 and is ineligible on the day he becomes 20 years of age. The pay of a midshipman is $600 a year, beginning at the date of admission. The course for midshipmen is four years. Examinations on the ground covered are held at the end of each academic term. During the summer midshipmen of the first, second and third classes go to sea for about three months. Midshipmen after graduation are commissioned as ensigns in the navy and occasionally to fill vacancies in the marine corps and in certain of the staff corps of the navy.

The Course of Study.— When a midshipman graduates he must be a seaman, an engineer, a true marine engineer, well acquainted with steam, electricity and ordnance, and a navigator and surveyor and he must have a fair knowledge of his own language with some acquaintance with French and Spanish. To achieve this in four years he must be well grounded in the rudiments; he must have good health and he must work hard. The course must be progressive and the instructors competent and in sufficient numbers to be able to instruct — not merely to examine and hear lessons. Even then the work of studying would be too hard for the average youth were it not for the fact that much of the practical work is good out-of-door exercise and the hard brain work is well-balanced with plenty of physical exercise and healthy amusement. The instruction for the fourth class, that is for the first year, completes the study of algebra and includes trigonometry and descriptive geometry. In English it includes rhetoric and something of the art of writing English and also public speaking. French and Spanish and mechanical drawing are begun. It is a necessity for a naval officer to be able to read a drawing and to make a good working sketch. The naval architect, the marine engineer and the ordnance engineer has each his special methods in drawing with which the midshipman must become familiar. Accordingly he starts drawing with the beginning of his course. All his professional work during this year is practical and is given him during the drill period. The academic year opens on 1 October and closes about 1 June; then comes the practice cruise, which is devoted almost entirely to practice professional work with some little study of the theory of professional subjects. The cruise ends about 1 September when the midshipmen have a month's leave to visit their homes. Academic life begins again on 1 October. During the third-class year the midshipmen complete their study of geometry and also mathematics with the exception of mechanics, a branch of applied mathematics, which is studied during the first term of the succeeding year. They have trigonometry, analytic geometry, conic sections, differential and integral calculus. In English they study naval history and constitutional law. They continue the study of French and Spanish and mechanical drawing and take up the study of elemetary physics and chemistry. Their practical work is continued during the drill period and on the practice cruise at the end of the academic year.

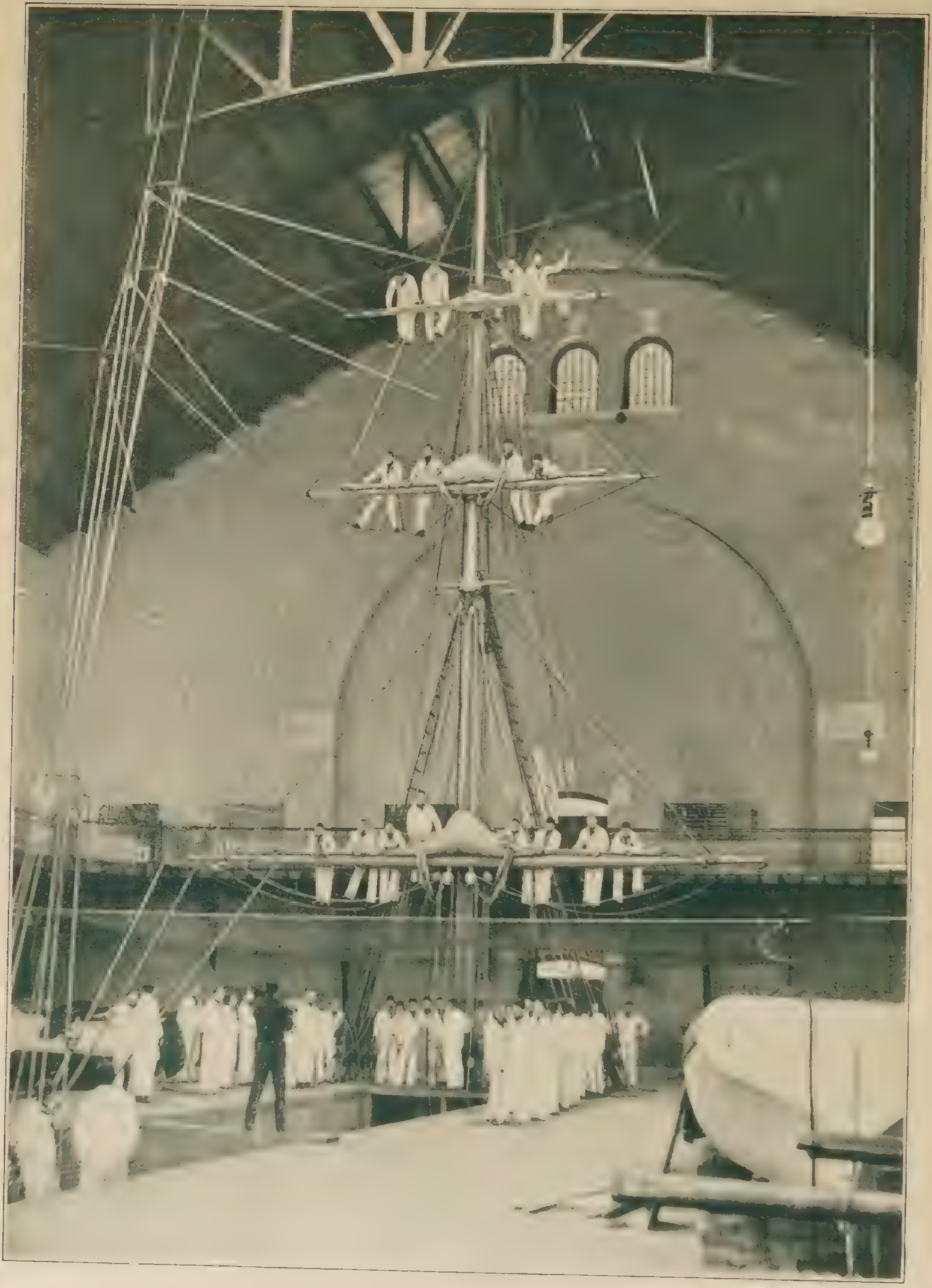
Second Class Men.— After the month's leave they take up their life at the academy as second-class men and now begin to take up the study of professional subjects. In the department of mathematics they study mechanics and hydromechanics. They continue the study of English, French and Spanish and begin the study of ordnance, navigation and electricity and magnetism and lay the foundation for engineering in studying the principles of mechanism with marine engines and boilers. The practical work continues during the drill period and has advanced progressively so that the midshipmen are well prepared for the professional subjects of this and the following year. This is their last practice cruise and by far the most important one, as they are now carefully instructed in their duties as officers. They are required to perform the work of officers at sea in handling the ship and managing the motive power, both steam and sail. They must work hard at practical navigation with instruments and charts. In their last year as first-class men they continue the study of French and Spanish, while the periods assigned to English are devoted to public speaking and during the first term they have a course in physiology and hygiene. All other studies are professional. They have seamanship and naval tactics, ordnance and gunnery, navigation, compass deviations and surveying, engineering materials, designing and naval construction and electrical engineering. The practical work goes hand in hand with the theoretical during the drill period. The first class are the officers of the regiment of midshipmen and under supervision perform much of the work of officers.

Athletics.— To discuss the training of midshipmen at the Naval Academy without mentioning athletics would be to leave out a most important factor in their character training. Boating, football, baseball, fencing, track athletics and gymnasium work are all encouraged. The various competitive games are a source of amusement to all and of healthy exercise to many. Courage and skill are gained and self-denial must be practised by those who train for the various sports and athletics furnishes one of the most important aids in training a youth to become an officer.

Academy Buildings.— In 1895 was commenced a new and improved plan of construction and reorganization of the school buildings



Apparatus for Indoor Training in Handling a Full-rigged Ship



Apparatus for Indoor Training in Handling a Full-rigged Ship at Annapolis. The new buildings are largely due to the efforts of two men — the superintendent at that time, Capt. Philip H. Cooper, now rear-admiral, and Col. R. M. Thompson, who graduated in 1868 and was in 1895 a member of the board of visitors. The board recommended the rebuilding of the Naval Academy and the energy of these two men pressed the scheme upon the government. The department was induced to order a board to consider and recommend a comprehensive plan for all the necessary buildings and Colonel Thompson persuaded the New York architect, Ernest Flagg, to consult with the board and with Captain Cooper. A set of artistic plans resulted, recommended by the board and approved by the department. But the Spanish War interfered and it was not till 1898 that an appropriation became available and the cornerstone of the new armory was laid by Rear-Adm. F. V. McNair, who had succeeded Captain Cooper as superintendent. The plan as viewed from the sea front shows the midshipmen quarters extending 729 feet, flanked on one side by the armory and on the other by the gymnasium. These buildings are at right angles to the direction of the midshipmen's quarters, are 428 feet long and similar in appearance. They are connected by colonnades with the quarters. This gives from the sea a harmonious group of buildings extending in a northeast and southwest direction for 1,278 feet with the high roof of the main building of the midshipmen's quarters as a centre. Thirteen hundred feet in a northwest direction, with the main line of buildings parallel to and facing the first group, is the academic building with the chemistry and marine engineering buildings on either flank and with the high roof of the academic building in the centre and balancing the group to the southeast. Between these two groups, facing the Severn River and forming the west side of the rectangle, is the chapel with the superintendent's house and the administration building on either side. The fourth side of the rectangle is formed by the basin. From the steps of this basin and facing the chapel is the best view. On either hand is a handsome group of buildings with the dome of the chapel as the centre. The new buildings involved an outlay of approximately $10,000,000.

NAVAL AERONAUTICS. The importance of the aeroplane in naval warfare is great and varied. It is most useful in scouting, in locating and bombing enemy ships and submarines and in spotting gunfire (observation of the fall of the shots). A squadron of battle cruisers with guns of large calibre, whose fire is controlled by aeroplanes, can defeat an equal or greater number of dreadnoughts that are without this means of fire control. While the military aeroplane made great advancement in efficiency during the European War of 1914–18, comparatively little progress was made in the design of naval aeroplanes and in the development of their tactics. This was evidently due to the fact that nearly all the air operations took place over land and when over sea in localities where flight could originate from smooth water. Real naval aeroplanes must be of the types that can operate from floating bases far from smooth water. The first problem in naval aviation is, obviously, getting into the air and the hydro-aeroplane, or aeroplane that starts and finishes its flight on water, cannot get into the air unless the water is considerably smoother than in average conditions on the open sea. Hydro-aeroplanes must attain an air speed on the surface that is equal to the low-flying speed limit before they can have sufficient lift to get into the air under control, this speed for the various types ranging from 40 to 60 miles per hour. With satisfactory means of getting into the air at sea, good operation is assured in nearly all kinds of weather; but, if flights must originate from the surface of water then the naval aeroplane becomes a fair weather apparatus having but little naval value except in operations near the coast. In naval aviation the problem of finishing the flight is not as difficult as that of getting into the air and is of much less importance.

For work with a fleet three types of aeroplanes are usually required — the high speed fighting aeroplane, the medium speed torpedo-carrying aeroplane and the slow-speed spotting aeroplane. The *high-speed fighting aeroplane* is a machine with a maximum speed of about 100 miles per hour, carrying one or more guns for attack on other aeroplanes and bombs for attack on dirigibles; it is a fast climber and is designed with little stability so as to be sensitive in its control and thus have good manœuvring qualities. The principal duties of this machine are to protect the torpedo carriers and spotting aeroplanes, to attack enemy torpedo carriers and spotting machines and to destroy or drive in the enemy's air scouts and dirigibles. On account of its high speed this machine has only a small radius of action when carrying the pilot and observer. On special occasions it can be used as a one-seat machine either to increase climbing ability or to increase its radius of action. The *medium-speed torpedo-carrying aeroplane* is a machine with a maximum speed of about 80 miles per hour, designed primarily to carry a torpedo or an equivalent weight (about 1,800 pounds) of high explosive bombs. It has only a small radius of action when carrying its torpedo or when loaded with bombs, but without these weights it can take on an equivalent weight of fuel and thus add five or six hours to its cruising radius. The principal duty of this type is torpedo attack on the enemy's battle fleet or troop ships, a function of the naval aeroplane that deserves a most important consideration in naval battle tactics. Aeroplanes of this type must have proper escorts of fighting machines to counteract the enemy's best means of defense or attack by his aircraft. This type when carrying extra fuel instead of its torpedo or bombs can be used for scouting and in this condition must be armed for protection in case of a possible contact with the fighting types of the enemy. The *slow-speed spotting machine* is a machine with a maximum speed of about 60 miles per hour. Its chief duty is spotting for control of gunfire and for this reason provides for long endurance and consequent slow speed. This type of aeroplane is most important in naval operations because at long-range firing it is absolutely necessary to control fire by spotting inasmuch as the naval range is inaccurate at long ranges and even when the exact distance of the target is known there are disagreements in the sight bar ranges and actual ranges that must be corrected by spotting observations, these disagreements increasing with the range. When ships are matched in speed and gun-power, those having aeroplane fire control have a positive advantage over those that control from the tops. This type of aeroplane, and especially the medium-speed torpedo-carrying type, perform the important duty of patroling the fleet when cruising in war time. On this duty some of the machines carry bombs and guns for attack on submarines.

During the European War airships were used most effectively by the navies in scouting work, locating mine fields, discovering submarines and communicating information to their own vessels either by signal or by radio. Airships are remarkable scouts and under ordinary conditions, in a few hours, can explore an immense horizon and inform surface warships by radio as to conditions for miles around. A fleet covered by a sufficiently large flotilla of such scouts can navigate with a practical certainty of avoiding surprise from a hostile or superior force. As to effectiveness the airship has a great advantage over the aeroplane in long-sustained flights, especially over sea. The aeroplane must land immediately in case of a mishap such as a stalled engine, a fractured propeller blade, etc., while an airship, on the contrary, can remain afloat and make repairs. Every well-balanced fleet should include a flotilla of airships. In the European War when it became necessary to build up a system of protection against submarines, the warring nations pressed into service thousands of small vessels, destroyers, trawlers and submarine chasers; and as fast as they could obtain them they put into service seaplanes and dirigibles to co-operate with the ships in locating and capturing and destroying hostile submarines and in convoying ships, protecting them from submarine attacks. The usual evidence of the submarine's presence is the wake of the periscope. This wake cannot easily be seen from ships, but can always be clearly seen from airplanes. For one thing the aviator is not troubled by the reflection of the rays of light which interfere with the vision of the person on a ship. The aviator, flying at a height of from 1,000 to 5,000 feet, has a range of vision of many miles and the whitish wake of the periscope is clearly visible against the dark surface of the waters even in cases where the sea is fairly rough and white caps are showing. Whatever the future development may be, the basis of any air service is its two-seated observation squadrons who do the work of observation, both visual by day and by night and photographic infantry liaison and artillery adjustment. A squadron of airplanes of this type must be provided for every divisional corps staff and army staff. The plans announced call for coast defense squadrons and observation and bombing squadrons. Inasmuch as the coast defense squadrons under army control are not expected to operate far beyond the range of the coast defense guns, all work further at sea is the duty of the navy. It is impossible to develop a comprehensive and efficient system of naval aeroplane tactics unless there are material and personnel sufficient to permit working with the fleet in large groups. These and many other problems must be worked out in peace time and the personnel carefully drilled, especially in the co-ordinating features of their work. Because of the high speeds and the great number of units dealt with in naval aeronautics, there is no branch or department of service work where thorough co-ordination is more vital to success. The art of flying is a comparatively insignificant part of a naval aviator's attainments. When in command of an aeroplane he must not only be an expert flyer but he must also be well versed in the whole subject of naval aeroplane tactics as well as being an expert seaman and navigator. See AERONAUTICS, HISTORY OF; AEROPLANE; MILITARY AERONAUTICS.

EDWARD S. FARROW,
Consulting Military and Civil Engineer.

NAVAL ARCHITECTS AND MARINE ENGINEERS, Society of. The Society of Naval Architects and Marine Engineers was organized under the laws of the State of New York 10 May 1893, its object being the promotion of the art of shipbuilding, commercial and naval. In furtherance of this object, annual meetings are held for the reading and discussion of appropriate papers and interchange of professional ideas, thus making it possible to combine the results of experience and research on the part of shipbuilders, marine engineers, naval officers, yachtsmen and those skilled in producing the material from which ships are built and equipped. Annual meetings have been held each year since the organization of the Society, the 25th annual meeting being held this year 15 and 16 November. Classes of membership consist of members, associates, juniors, honorary members and honorary associates and benefactors and permanent members. Its membership comprises all the leading naval architects and marine engineers in the United States as well as the other leading countries of the world. The papers and discussion are combined in volumes which are forwarded to the members as part of their membership as soon as they are compiled and edited. These volumes comprise valuable books of reference and are also on the shelf of all the leading libraries in this country.

NAVAL ARCHITECTURE deals with the designing and development of the nautical qualities of ships as distinguished from their construction, which belongs to shipbuildng. The existence of naval architecture as an art probably dates back to the first development of man, but its elevation into a science can scarcely be recognized until the 19th century, as a part of the advance in all mechanical sciences during that period. During the 18th century, and even earlier, some Continental mathematicians had devoted attention to the subject and developed various theorems concerning floating bodies which were likewise applicable to ships. Throughout this period the French were the acknowledged leaders in the development of knowledge relating to such matters. So much was this the case that it seems to have been not unusual for other countries to reproduce the models of French men-of-war, thereby admitting the excellence of the French type and paying deserved tribute to the labors of the naval architects of that country.

Perhaps the most notable attempt, however, to place naval architecture upon a logical and scientific basis, prior to 1800, was that of the famous Swedish naval architect, Chapman (1721–1808), who, during his long career, achieved special eminence in his profession and wrote a number of treatises relating to various features of naval architecture. One hundred years ago each nation, and, indeed, each master builder, carefully guarded as valuable secrets the methods and theories pertaining to the science of naval architecture, which had been deduced from experience or which had been handed down by those who had conducted previous investigations. This state of affairs, indeed, extended well into the 19th century, but with the rapid development of iron shipbuilding, which started about the middle of that century, came a rapid advance in naval architecture and dissemination of knowledge upon the subject, until, to-day, in the leading shipbuilding countries of the world will be found schools devoted to this subject; and the products of the naval architect's skill differ only in comparatively minor respects, whether turned out from British, European, American or Japanese shipyards.

The primary object of the vast majority of all ships is to-day, as throughout the past, *transportation*, and the problem is only affected in its details in order to conform to the requirements of the articles carried, be they men, merchandise, or, in the case of men-of-war, armor, armament and other appliances for rendering the vessel efficient as a fighting machine. The foregoing statement is quite as true of the humble 10-knot collier, which will carry in coal twice the weight of her hull, machinery and outfit, as of the trans-oceanic passenger liner which carries a comparatively small amount of cargo but a large quantity of bunker coal to enable it to make a high speed, and provides luxurious accommodations for numerous passengers. It is true also of the man-of-war, which carries a proportionately large crew and a fair amount of cargo in the shape of consumable stores, coal and ammunition, besides a considerable weight of armor, heavy armament, and the necessary military adjuncts required by the special service upon which employed. Considering, then, all ships as bearers of burdens, there are two essential characteristics which they must show: They must be able to go from point to point at an appropriate speed and with all reasonable safety for ship, cargo and crew. Ability to keep the sea under all the usual conditions of its intended service is indispensable for every ship, and we will now consider briefly the detailed factors entering into the problem.

Buoyancy.— When a ship is entirely waterborne, the weight of water which it displaces is exactly equal to the weight of the ship itself and everything contained in it. To float at all, the volume of the enveloping surface of the ship must be greater than the volume of water which equals in weight the displacement of the ship. Clearly, for safety, there must be a margin, or reserve of buoyancy, in the ship over and above the buoyancy equal to its weight. The percentage of reserve buoyancy varies widely according to the type of vessel, passing from approximately zero in the case of diving, or submarine, boats (when in condition to dive), to as much as 100 per cent or more in the case of passenger vessels with large deck areas and high sides. In certain types of men-of-war, notably the large cruiser class, the percentage of reserve buoyancy is also very high. In the case of men-of-war, the reserve buoyancy is practically fixed by the design; but, in the case of merchant vessels, and particularly cargo carriers, which are subject to overloading, the reserve buoyancy is now practically determined by the marine insurance companies. The business of insuring ships and their cargoes is a large and important one, but is carried on by a comparatively small number of very powerful companies or associations, and these companies, for their own protection, have a well-equipped, scientific and technical staff and have prescribed conditions affecting the safety, or seaworthiness, of ships, which must be complied with in order to obtain insurance at a reasonable rate. In England, the Board of Trade, which is the department of the government charged with authority over matters relating to shipping, has acted in conjunction with the large insurance companies in laying down requirements for reserve buoyancy, these authorities being still further assisted by representatives of the national associations of naval architects. The actual amount of reserve buoyancy required varies somewhat with the size and type of vessel, and likewise with the character of the service, the maximum amount being required for vessels engaged in winter service in the north Atlantic Ocean. Speaking broadly, the objects aimed at in the load-line requirements are to obtain the greatest possible carrying capacity, compatible with safety of the vessel under all conditions of weather, after making provision for minor casualties which might still further reduce the reserve of buoyancy.

Structural Strength.— Buoyancy, however, is not the only requirement for seaworthiness of a ship. It is essential that the ship should be strong enough to withstand the stresses due to the action of the waves. In this direction, also, the insurance companies have taken a prominent position, and laid down minimum requirements acceptable for merchant vessels. Strength is obtained not only by the use of the best materials but by the disposition of the material used in such manner as to best accomplish the desired results. The methods used in determining the strength of ships are very similar to those used in determining the strength of other structures, such as bridges, but there is an essential difference due to the fact that it is practically impossible to determine the maximum load to which a ship may be subjected. It is comparatively easy to calculate the strength of the hull structure, knowing the disposition of the weights and buoyancy of the vessel. The stresses upon each part of the vessel's structure, when floating in still water, may be determined with accuracy; but the maximum stress will occur, not in still water, but among waves, and while we know that, whatever the motion of the sea, the buoyancy of the submerged portions of a ship must equal the total weight of the vessel and its contents (subject to minor corrections, due to the dynamic effect of the motions of the ship itself), it is obviously impossible to foresee the possible combinations and contours of waves to whose action the ship may be subjected and the consequent distribution of buoyant forces and structural stresses. Hence, the naval architect, in determining the structural requirements of a ship so far as they affect its strength, must be guided largely by experience. If he provides strength equal or superior to that of ships of the same type and not very dissimilar in size, which have shown no weakness in service, he has reasonable assurance that he is safe. But, when dealing with vessels of a novel type or size beyond precedent, the skill and judgment of the designer are taxed to the utmost to accurately estimate in advance and provide against the maximum stresses that may occur in service. In this respect, also, the accumulated experience of the marine insurance societies has been of great value in determining adequate strength associated with weight of structure which is not excessive, and which will permit a maximum development of carrying and other desirable qualities. The natural tendency of such societies, however, is to make sure of adequate strength, necessarily giving to weight and cost merely secondary consideration; so that whenever a novel type of ship is put forward, there is apt to be a period of discussion and unsettlement. The builders and owners naturally desire to provide only the minimum strength necessary, in their judgment, for complete seaworthiness, while from the point of view of the insurer, if any error is made it should be positively on the side of excessive strength. As the results of experience accumulate, these questions adjust themselves, but with the rapid development in the size of ships, and the variations in types which have been witnessed since the last quarter of the 19th century, shipbuilders and the insurance societies have not been entirely in accord on such questions.

Stability.— In addition to the elements of adequate buoyancy and strength, there must be considered an equally important factor in the seaworthiness of the vessel,— namely, *stability*. This quality is all-important in rendering the vessel safe and enabling it to resist the capsizing effect of wind and waves. The stability problems which must be solved by the naval architect are practically peculiar to his profession. Sailing vessels, to avoid capsizing, must be handled with skill, and sail must be reduced in ample time to avoid the disastrous consequences of undue wind pressure. Steamers of the present day carry practically no sail, and are liable to be capsized by the sea only. But with them, too, there is room for skill in handling with reference to the direction of the waves, etc. It is the duty of the naval architect to provide a vessel, in either case, which, when handled with ordinary skill, will be stable under all probable conditions of wind and weather. The general feature of the problem of stability are comparatively simple, and may be readily understood by considering a ship floating in still water. Under these conditions, the whole weight of the ship may be regarded as concentrated and acting downward through its centre of gravity. The upward forces of buoyancy may also be regarded as concentrated into a single upward pull through an imaginary point called the metacentre. With the ship at rest, the downward pull through the centre of gravity must be exactly equal to the upward pull through the metacentre. Evidently, if the metacentre is directly below the centre of gravity, there will be unstable equilibrium, since any slight accidental deflection of the centre of gravity would result in further deflection, the forces of buoyancy and gravity acting as an upsetting couple; if, however, the centre of gravity is below the metacentre, the resultant of the downward pull through the centre of gravity and the upward pull through the metacentre produces a righting moment tending to return the ship to the upright position. The name «metacentre» is supposed to have originated from the Greek word «meta,» meaning «limit» or «goal» beyond which the centre of gravity cannot pass. Possibly it would have been more logical if the metacentre had been called the centre of buoyancy, thereby causing the nomenclature of the centre of buoyant forces to correspond more exactly to that of the centre of gravity. But in the naval architecture, the centre of buoyancy is the name given to the centre of gravity of the volume of water displaced by the immersed portion of the ship. The line of action of the resultant upward forces of buoyancy must obviously pass through the centre of buoyancy, and it therefore follows that the centre of buoyancy and the metacentre are always found in one vertical line. The metacentre is not a fixed point but rises and falls as the ship inclines, owing to the varying shape and proportions of the immersed portion of the hull, and in every ship there is finally found an angle of inclination at which the metacentre is found directly below the centre of gravity. For inclinations greater than this, there is a tendency for the ship to capsize instead of right itself. The inclination at which this occurs is called the capsizing angle, and the angular range through which the vessel can be inclined without capsizing is called the «range of stability.» Generally speaking, the less the freeboard (or height of side above water) the smaller the range of stability. In practice, the range of stability necessary for safety is affected somewhat by the initial metacentric height, or the distance between the centre of gravity and the metacentre when the ship is upright. The greater this distance the greater the effort required to heel the ship, and hence the range of stability may be made less with safety. In practice, with any type of ship the range of stability can seldom be safely made less than 50 degrees, and, in the majority of cases, should be much more. It is frequently over 100 degrees for vessels of high freeboard. For safety alone, it is not always necessary that, initially, when in the upright position, the metacentre should be above the centre of gravity. If the metacentre is slightly below the centre of gravity, the vessel will heel over a few degrees to one side or the other until it reaches an inclination at which the metacentre rises above the centre of gravity and the vessel becomes stable again; if the freeboard of the vessel is high and the range of stability is great, such a vessel may be perfectly safe. Several of the large trans-Atlantic liners are purposely designed with comparatively small initial metacentric height, as such a condition permits the vessel to respond less quickly to wave action and causes easy and slow rolling.

Rolling.— Closely associated with the question of stability is the question of rolling in a seaway. When a vessel is floating in disturbed water the effect is to change the relative location of the centre of buoyancy so that the metacentre shifts to one side or the other of a vertical line through the centre of gravity, causing a tendency to heel or roll the vessel until the metacentre again becomes immediately above the centre of gravity. Moreover, by this time the vessel has acquired certain angular velocity so that it swings beyond the position of equilibrium. An analysis of the theory of the rolling of ships at sea would be too complicated to be instructive in an article of this character, but, as in the case of stability, there are certain broad, underlying principles. These would be comparatively simple if in a floating body of ship-shape form the metacentre were fixed. In the case of a floating circular cylinder, such a condition does exist, the metacentre being fixed and remaining always at hte centre of the cylinder. In such a case, the motion of a ship rolling is very closely analogous to what it would be if the vessel were suspended on pivots at the height of the metacentre. In such an imaginary case, in conformity with the well-known principles covering the motion of compound pendulums, the closer the metacentre is to the centre of gravity the longer the period of oscillation, and the further the metacentre from the centre of gravity the shorter the period of oscillation. In actual ships floating in water, however, the question is complicated by the varying position of the metacentre and the resistance of the water, which, in the absence of new disturbing causes, rapidly brings rolling ships to rest. But the fact remains that vessels of large metacentric height are inclined to roll very quickly, while those of small metacentric height are sluggish in their rolling motion. When floating among waves which are large as compared with the vessel, the vessel of great metacentric height tends to float like a board, keeping its deck fairly parallel to the surface of the water; while the vessel of small metacentric height will at times be found rollling toward the wave crest instead of away from it,— a very undesirable condition with low free-board vessels. In practice, vessels vary widely in their periods of oscillation. For a large vessel, perhaps the shortest period met with in practice would be that of a low-freeboard monitor, which, on account of its large metacentric height, may make a single roll from extreme inclination in one direction to the extreme in the other in from two and one-half to three seconds, while a large vessel of small metacentric height may take as much as 20 seconds to the single roll. While rolling through small angles, say under 10 degrees, the motion of a vessel is practically isochronous, that is to say, the period or time of completing a roll varies but little with the angle. This ceases to be true when vessels reach large angles of roll, say 30 degrees or more. If there did not exist a retardation of roll in heavy rolling there would be grave danger of vessels, otherwise perfectly safe and seaworthy, being capsized by an accumulation of roll, every passing wave adding a little to the amplitude of roll,— well illustrated by the fact that with properly-timed impulses comparatively small forces will give large oscillations to a swinging weight. In actual practice, the skilled seaman can do much to limit excessive rolling by shaping the course of the vessel so as to produce complete lack of synchronism between the period of the ship and that of the waves. The naval architect, however, in the original design of the vessel utilizes the resistance of the water and provides «bilge» or «rolling keels,» which aid materially in preventing heavy rolling. Bilge keels are projections at the bilge of the ship, approximately from one foot to three feet in depth, and extending usually for about half the length of the vessel and so situated when practicable as to offer maximum resistance to rolling. When properly fitted, bilge keels will often reduce the maximum angle of rolling, under adverse conditions, to less than half what it would be without them.

Speed and Resistance of Ships.— It has already been pointed out that an essential characteristic of all ships is mobility. The speed of a ship is a simple, concrete fact, readily appreciated by anyone and comparable with the speed of other ships; therefore, in many cases, it is considered the most conspicuous and important quality of a ship, whether man-of-war or passenger steamer. The keen interest taken by the general public in the speed records of passenger steamers engaged in trans-oceanic service fully illustrates this fact. The present accepted methods of determining the power necessary to drive a given ship at a given speed, and, conversely, the form of ship best adapted to be driven by a given power, are of comparatively recent development and largely due to the late William Froude, who, through an elaborate series of experiments, established the truth of the fundamental laws upon which are based the present theories of the resistance of ships. The resistance of a given ship, moving at a given speed, is made up of three main factors: first, the skin friction of the water on the surface of the ship. This is dependent only upon the surface exposed and the speed of the ship. It varies slightly with variation of form, due to this variation affecting the velocity of the water over the hull, but this variation is too slight to be taken account of in practice. The second element of resistance is what is called «wave-making resistance,» due to the fact that a ship in moving through water produces waves and the force required to produce these waves proportionately reduces the power available for propulsion and thus, in effect, increases the resistance to the motion of the ship. The third element is what is called «eddy making,» due to eddies of the water behind square corners of the hull and attachments, such as stern-post, propeller strut, etc. The eddy-making resistance is, however, comparatively small. The skin frictional resistance of a ship can be readily calculated with sufficient accuracy from the results of experiments upon the friction of plane surfaces drawn through water at known speeds. Mr. Froude demonstrated that the remaining resistances (wave and eddy making) of a full-sized ship could be estimated with great accuracy from a careful determination of similar resistances experienced by a small model of a ship when towed at a speed corresponding to the desired speed of the ship, the corresponding speeds of model and ship being in the ratio of the square roots of their linear dimensions. For a ship 500 feet in length, and a small model 20 feet long, the ratio of linear dimensions is 25; so that the actual speed of the model corresponding to 20 knots for the ship, would be $20 \div \sqrt{25}$, or four knots. By model experiments, also, it is comparatively easy to investigate the general effect of changes in shape and dimensions of vessels without having recourse to experiments with full-sized ships. The principles applied in passing from models to full-sized ships were also applied by Mr. Froude in passing from one full-sized ship to another,— being quite applicable if the two ships are similar, and applicable with fair approximation if the two ships are reasonably similar in proportions and shape.

Model Basins.— Experimental model basins are now found in nearly all shipbuilding countries. That of the United States is located at Washington. It is about 500 feet long, and, at its maximum section, the water is about 42 feet wide and 14 feet deep. Wooden models 20 feet long, made by special machinery, are used in this experimental work, the model being towed back and forth through the water by an electrically-actuated carriage which spans the basin. When erected in 1899, this was the largest experimental basin in the world. Later experimental basins built in Germany, however, are somewhat longer but not so deep or wide. From data obtained with models towed in the experimental basin, the effective horse power, as it is called, necessary to tow the full-sized ship without engines, is determined with great accuracy. It is therefore necessary to establish, from actual trials, the relationship between this effective horse power and the indicated horse power which the ship's engines must exert. This ratio depends upon the friction of machinery, efficiency of propellers and to some extent upon the shape of the stern of the ship and other minor factors; it is found, in practice, that it ranges from .50 to .60, although there is seldom reason why it should not be made as great as .55, a lower value being usually due to mistakes in design of hull, unsuitable propellers or some such cause. The tabulated data obtained from experiments with models in the experimental basin, supplemented by progressive trial data taken under actual seagoing conditions, from the full-sized ships, have in recent years greatly aided the naval architect and the engineer in their design work.

Materials Used in Shipbuilding.— As the development of naval architecture has been largely influenced by the materials used in ship construction, brief allusion to these materials seems appropriate. The material used in the construction of ships underwent, broadly speaking, two changes during the 19th century; a change from wood to iron, which dates approximately from about the middle of the century, and a change from iron to mild steel, which dates from about 1880. Wood is still used as material for shipbuilding, many coasting vessels, for instance, in the United States and elsewhere being still built of wood; but the number and importance of wooden ships as compared with those of iron and steel is diminishing yearly, and, at the present date, it may be said that the only structural material of importance for the construction of ocean-going ships is steel. Open-hearth steel, suitable for shipbuilding purposes, with an ultimate tensile strength of about 60,000 pounds to the square inch and an elongation of an 8-inch specimen of from 20 to 25 per cent before rupture, was introduced between 1870 and 1880. It was practically unknown in the United States in 1880. The contractor for the first steel vessels of the new navy, which were contracted for in 1883, had to make special arrangements for the domestic manufacture of the steel needed in his work, and had to pay for it at that time about seven and one-half cents per pound. The growth of the manufacture of this material in the United States since that date, however, has been astonishing, mild steel of nearly the same characteristics as that used for ships being used in large quantities for bridges, houses and other structures, so that, about 1900, its price had fallen as low as one and one-half cents per pound, as compared with seven and one-half cents per pound some 15 years earlier. The qualities of the steel used in shipbuilding vary little in the different shipbuilding countries, being prescribed, as a rule, for merchant ships, by the marine insurance societies. For men-of-war, a somewhat higher grade of material is prescribed, and the inspection is rather more rigid. The use of nickel-steel, too expensive for commercial vessels, but very superior for armor plates and guns, gives an added strength of 30 per cent over open hearth steel. It retains its fibrous structure under strains and shocks where carbon steel crystallizes and crumbles. Coincident with the development of iron and steel as materials for shipbuilding, there began to develop an increase in the size of ships, due to the greater strength of the material of construction, and probably also to the fact that the use of steam instead of sails for propulsion made it possible to increase the propulsive steam power of the large ships when it would not have been possible to add correspondingly to their sail area. The tendency toward an increase in size has been very marked since 1885, until now ships have reached sizes and dimensions limited only by the draft of water and the docking and wharf facilities available in the ports to which they trade.

The urgent necessity of quickly replacing the shipping destroyed by the German submarines, while it did not and could not alter the basic principles of naval architecture, called for adaptations which departed widely from the practices of the period preceding the Great War. The lack of shipyard facilities and of highly trained shipbuilders led the men in charge of the government program to enlist the structural iron workers of the country in the great problem of producing ships. The "fabricated ship" thus came into being, designed in such fashion that its parts could be constructed by the makers of steel bridges, tanks and frames for skyscrapers. Wherever angles could take the place of familiar bends and curved surfaces the change was made, and quantity tonnage was thus expedited, although the new models were less speedy than the more scientific hulls of former years. The structural shops were able to do nearly all the punching, shearing and bending of the plates, and only the assembling and rivetting and the expert fashioning of bow and stern was done in the shipyards. Another effect of the emergency was the standardization of types of vessels to be built. When the Shipping Board began its work there were many different types of vessels under construction in the shipyards of the country. The government representatives speedily recognized that much labor was lost in this diffusion of effort and a few types were selected and all agencies concentrated on the utmost possible production of these typical ships. The standard cargo vessel was a single screw steamer of 9,600 tons deadweight, 395 feet in length, 55 feet molded beam and 34 feet molded depth; the engines, geared turbines of 2,500 horse power, and the fuel, oil. Another type was the combined passenger and cargo vessel, arranged for use as a troopship, carrying 2,700 troops and 7,000 tons of supplies. This type with a displacement of 20,900 tons was 522 feet in length, 62 feet beam and was equipped with twin screws driven by two sets of four-cylinder triple expansion reciprocating engines. Its speed was 14 knots which could be increased to 15 knots in emergencies. Another selected type was the 10,000-ton oil tanker, 435 feet long and 56 feet beam, equipped with a single screw, triple-expansion engines and oil-burning boilers. A revival of wooden ships resulted in the production of 3,600-ton vessels, 286 feet in length and 46 feet beam. A particular type of architectural design gave them the title of «Ferris ships,» after their designer. While not wholly a development from war conditions the production of the Diesel ships was stimulated by the demand for ocean tonnage, and these, too, were standardized in the interest of rapid multiplication, the selected type being of 9,600 deadweight tons with turbine engines driving twin screws. The compactness of the Diesel engines gave these vessels the advantage of 13 to 14 per cent larger carrying capacity for an equal displacement, and operated with a smaller crew and at a higher comparative speed. Another architectural development was the reinforced concrete ship, successfully built up to 3,500 tons, and with designs approved up to 7,500 tons. The fact that only $60,000 worth of steel was needed in a 5,000-ton concrete ship as compared with $300,000 worth in an all-steel ship led to earnest effort in this direction. A special form of concrete lighter than wood and impervious to water was developed by the architects in charge, and the completed ships were found to be unusually free from the vibration common to all-steel vessels. Composite ships of wood and steel were also planned and built to meet the emergency caused by the war.

The present state of development of naval architecture is probably best illustrated by examining the characteristics of some of the most recent products of shipbuilding skill in this country as exemplified in the principal characteristics of the United States battleship *Idaho,* commissioned in March 1919, and the new troopships mentioned above, which are representative of our latest American designs. Commercially, it is found that the large steamer will carry freight or passengers cheaper at the same speed, or faster for the same cost, than the small steamer. The large man-of-war, on the other hand, is able to carry a much greater weight of armor and armament and can maintain a higher sustained sea speed than is practicable in a vessel of small displacement. See WARSHIPS.

Bibliography.— Biles, J. H., ‘The Design and Construction of Ships’ (2 vols., New York 1908–11); Carmichael, A. W., ‘Practical Ship Production’ (New York 1919); Holms, A. C., ‘Practical Ship Building’ (2 vols., London 1916); Kelly, R. W., and Allen, F. J., ‘The Shipbuilding Industry’ (Boston 1918); Peabody, C. H., ‘Naval Architecture’ (New York 1904); Steele, J. E., ‘Naval Architecture’ (Cambridge 1917); Robinson, R. H. M., ‘Naval Construction’ (Minneapolis 1909); Atwood, E. L., ‘Text-book of Theoretial Naval Architecture’ (London 1911).

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NAVAL AUXILIARY VESSELS. When the United States became an active participant in the European War it became at once necessary to provide for meeting the demands for vessels for various naval auxiliary uses. Congress, in anticipation of the situation which did arise when the United States became a belligerent, included in the Naval Appropriation Act, approved 4 March, 1917, under the naval emergency fund provisions which were construed as giving the department the right to commandeer vessels needed for naval use in war. To safeguard the interests of the government and avoid as far as possible the payment of unreasonable prices for the vessels so acquired the department arranged for and organized a Board of Appraisal for Merchant and Private Vessels, three members of whom were at the time of their appointment civilians especially qualified by education, previous occupation and experience, and possessing a reputation for knowledge of values of vessel property and for disinterestedness which the department felt would be recognized by owners of vessels sincerely desirous of co-operating with the department without taking advantage of the exigencies of the situation. These men were commissioned as lieutenant-commanders in the Naval Reserve Force. The three other members designated by the department for this board were from the list of regular officers of the navy, one a senior line officer, one an officer of the Constructive Corps of the navy and one a line officer with special engineering experience and knowledge. The board was directed by the department to appraise and fix the fair value of each piece of vessel property which the department considered acquiring, either by purchase or by charter, and the values so fixed were used by the department in its negotiations with the owners of the property. In no case was any vessel property acquired by the navy if the demands of the owner were materially at variance with the findings of this board as to the fair value of the property. The department found a general wish to co-operate on the part of owners and acquired a number of vessels in this way. This spirit of co-operation was especially noticeable among the owners of yachts and other pleasure vessels, a large number of which were required almost immediately after the entry of the United States as a belligerent. It has since been charged that some young owners of such craft were in this way enabled to escape induction into the army.

It became apparent, however, that the powers granted under the naval emergency fund provision of the Naval Appropriation Act were not sufficient to fully meet the situation, and Congress included in an act making provision to supply urgent deficiencies in appropriations for the military and naval establishments, etc., approved 15 June 1917, provisions granting broader powers under which possession of property needed by the navy for prosecution of the war might be taken possession of by the department subject to the payment of just compensation to the owners, which compensation the act in question provided should be fixed by the President.

Information as to the property taken, its age, the character of the maintenance thereof, the betterments made thereto, the date on which the property was taken by the Navy Department and the condition of the property at the time it was taken, was supplied to the board, in most cases fully, by the Navy Department. At the hearings granted interested parties, they were permitted to present evidence or information regarding the property which had been taken, supplementing or modifying the information supplied by the Navy Department. In special cases the board made investigation of these matters directly or through agents where this course seemed necessary to the proper performance of the duties of the board. In preparation for the deliberations by which the board arrived at the prices or just compensation, the board procured all possible information from every available source regarding: (a) The opinions of experts regarded by the board as disinterested as to the value of the property under consideration; (b) the testimony of experts produced by the interested parties, as to the value of the property under consideration; (c) the prices at which similar property of like character to that under consideration had been sold at or about the time the property under consideration was taken by the Navy Department and the conditions surrounding these transactions; (d) the availability of the property for commercial use; (e) the demand for property of like character for commercial purposes; (f) the original cost of the property; (g) the value of the property under normal conditions; (h) the cost of the property to the owner up to the time the property was taken: (i) the time when the property was acquired by the owner, the use to which the property had been put by the owner and the gross and net earnings of the property in the hands of the owner for a period of from three to five years before possession was taken by the navy; (j) the cost to reproduce the property taken and the time required for such reproduction.

In time of war or during the existence of a national emergency, members of the Naval Reserve Force of sea-going profession who have been employed in American vessels of merchant marine of suitable type for use as naval auxiliaries are required to serve only in vessels of the merchant ship type, except in cases of emergency, to be determined by the senior officer present, when said officer may in his discretion detail them for temporary duty elsewhere as exigencies of service may require. Officers in the Naval Auxiliary Reserve exercise military command only on board ships to which they are attached and in the naval auxiliary service. The annual retainer pay of members in this class after confirmation in rank or rating is for officers one month's base pay of the corresponding rank in the navy, and for men, two months' base pay of the corresponding rating in the navy. All naval auxiliary vessels are grouped in districts and each group is placed under a commandant of the district, who is a naval officer of rank and experience. In this way the department is able through the various commandants of districts to carry out problems involving patrol and defenses of the coast, mine sweeping, communications, information, industrial developments, housing facilities, commandeering vessels, etc., in a very efficient manner.

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NAVAL CONSTRUCTION. See Naval Architecture.

NAVAL CONSTRUCTORS, officers of the United States navy, detailed to look after the designing, building and repairing of warships. New types of ships are adopted after recommendations of the General Navy Board and chief of operations. The chief constructor and assistants in the Bureau of Construction and Repair of the Navy Department work out the design and details in consultation with the chiefs of Bureau of Steam Engineering and Ordnance. At every navy yard there is generally a naval constructor on duty. These officers are chosen from Naval Academy graduates and are prepared for their work by special education at technical schools. Latest statistics enumerate 51 naval constructors, five captains, five commanders, 23 lieutenant-commanders and 18 lieutenants; assistant constructors number 24, including 14 lieutenants and 10 junior lieutenants.

NAVAL EDUCATION. Thorough educative and systematic study constitute the base rock foundation in the grasping of the principles of the art of war, naval or military. No navy nor army can hold its own that fails to keep abreast of sciences that relate themselves to naval or military needs. The educational policy of the most modern navies is based on the fact that the seamanship of the future is dependent on the increasing utilization of the data of science, whether in mechanics, chemistry, physics, electricity, marine engineering or naval construction. Constant experimentation and adaptation, discovery and invention, readiness to abandon the outworn and willingness to try the untried, must go hand in hand with a growing navy, especially with a navy that is itself a vast educational and training school. The new demands, however, do not imply multiplication of studies so much as greater thoroughness in fundamentals. Science is one, though its branches are numerous and ramifying.

United States.— Recent acts of Congress and laws increasing the number of midshipmen have largely increased the attendance at the Naval Academy and other naval institutions. The number of midshipmen coming from the enlisted personnel is increasing, and it is to be hoped that the day will soon come when most, if not all, appointments to the Naval Academy will come from the ranks. When a prerequisite to appointment as midshipmen at the Naval Academy is actual practical sea service in the enlisted ranks, the navy will more and more attract the youths who love the sea and have the taste and the qualifications for the naval service. The Naval Academy was established by George Bancroft in President's Polk's administration. His state papers were models, and the Secretary of the Navy is remembered as scholar and writer as well as a secretary with a vision. Bancroft felt the need, as did John Paul Jones and Matthew Fontaine Maury and other naval leaders, of an institution to educate young men for the navy, but it remained for Bancroft to translate their dream into the Naval Academy. The efficiency of the navy of to-day is largely, if not chiefly, due to the character of the instruction and the high standards that prevail at the Naval Academy.

The United States Naval War College was formally established at Coaster's Harbor Island in Newport Harbor, Rhode Island, in 1884. Recently an applicatory system of study, similar to that in use at the Army War College and at the service schools, was introduced at this college and endeavors are now being made to cultivate in the minds of the officers of the navy the habit of systematic reasoning in approaching tactical or strategical problems, such as is given by an «estimate of the situation.» An effort is also being made to develop a form of «campaign orders» modifying the field order form to suit all needs and varying conditions. Co-operation in time of war is greatly aided if each service has some personal acquaintance with the other. This acquaintance can be best brought about by the exchange of visits and hospitalities among officers afloat and ashore, and by the exchange of officers in attendance at the service schools and war colleges. The last is deemed of the greatest importance, as thereby selected officers who in time of war may exercise high command or staff duty are thus brought in touch, in a professional way, with the sister service. They find out what may be most probably expected from the other service in time of war; they learn something of the methods and professional opinions of the officers of the other service; and if at the war colleges, they assist in the preparation of the war plans. This interchanging of officers is most fruitful of good results. Army officers are detailed to attend the summer conferences at the Naval War College and navy and marine officers are designated to attend the Army War College and marine officers attend the army service schools at Fort Leavenworth. Along the same line is the detailing of officers of the Coast Artillery corps to attend fleet target practices.

Beyond the training of seamen and firemen, which is the principal general purpose of the stations above mentioned, is the matter of training mechanics, radio operators and many other specialists who must be skilled craftsmen as well as good sailors. There are schools for cooks, also, for well-prepared food is regarded as important enough to justify training in cookery. These men, whatever their origin or previous experience, must be further trained by and for the navy, first in discipline and second in their trades. A plumber, carpenter, electrician, coppersmith, machinist or what not, skilled in his trade as practised in civil life, has much to learn before he can efficiently ply his trade on board a naval vessel. Prior to the European War, artisan recruits were trained in the naval trade schools maintained for this purpose. These schools were at once expanded as far as conditions permitted, but with the enormously increased demand the schools could not be made large enough to supply the requirements if the entire course of training were conducted in such schools. In conjunction with the establishment of the Students' Army Training corps by the War Department, the Navv Department established naval units in over 90 educational institutions of collegiate grade. The object of these naval units is to extend to ambitious students the opportunity to continue their education along the usual channels, at the same time electing special naval subjects. In addition, the student is under constant supervision and receives military drills and instruction.

At the naval training station, Great Lakes, Ill., is maintained one regiment of about 4,000 men, known as the public works regiment. The officers and petty officers are men of exceptional engineering knowledge or practical ability, and the regiment is so organized that a complete force of any required size, with its engineer officers, foremen, expert mechanics, journeymen and helpers can be quickly assembled as a unit and sent anywhere to undertake emergency construction or repair work involving structural steel erection, woodwork, masonry work with all pipe fitting, plumbing, electrical and similar accessories. Drafts from this regiment are replaced by recruits who are kept in training, both practical and bookwork, to increase their knowledge of their trade. At New London is a ship salvage organization officered by professionals in this line of work, at which men are trained and organized into salvage crews. This is in itself a training school for a wide variety of trades, including diving and the handling of high explosives.

For the benefit of men who enter the navy with some knowledge of or experience in a trade, or special vocation, the navy maintains trade-schools as follows: The Navy Electrical School for the instruction of electricians, both general and radio; the Artificer School for shipwrights, shipfitters, carpenters, blacksmiths, painters, etc.; the Yeoman School for stenographers, typewriters and bookkeepers; the Commissary School for cooks, bakers and commissary-stewards; the Hospital-Corps Training Schools for the instruction of men in nursing, first-aid, drugs, etc.; the Coppersmith School; the Machinist School; the Aeronautic School; the Musician School; the School for Diving; the Torpedo School and the class for instruction in gasoline engines. Not all of these trade schools are open to men on their first enlistment. Some, such as the machinist school and the torpedo school, are open only to men of good record upon re-enlistment. All the schools are conducted, however, for the benefit of enlisted men of the navy who desire to fit themselves for more responsible duty and better pay. In most instances, the training obtained in these schools will stand the men in good stead in civil life should they decide, after a few enlistments, to remain out of the navy. Former bluejackets, who owe their success to the training they received while in the navy, may be found in nearly every large industry holding enviable positions.

In addition to the practical instruction imparted at the training stations and in the navy trade schools, a course of academic instruction is conducted throughout the naval service. Every recruit is examined as to his educational needs and, if he is deficient in any common school studies, he is assigned to such classes as will supply the education he lacks. The academic instruction does not stop at the training stations, but continues on board ship; and if a young man shows a willingness to advance himself, he is given every encouragement and is afforded an opportunity to demonstrate his ability.

England.— Made up of diverse elements, the English system of naval education has a certain unity throughout, which is due solely to the fact that the whole is practically under one head. Except for the gunnery training and the seamanship, which is instilled by some process on board ship, the whole training of officers is under the direction of the director of studies at Greenwich. His control does not go so far as the devising of a general plan; that is a matter for the Admiralty. From the time the young man of 12 or 13 passes his examination for a cadetship down to his last volunteer course as a captain, through the *Britannia,* the course afloat, the sublieutenants' collegiate course and the subsequent voluntary studies, his education is under the Admiralty rules, and it is managed with all the wisdom and judgment that the rules will permit. The importance of this single head for the whole system cannot be overestimated. The expedients adopted with reference to the higher education of voluntary students and the admirable courses of instruction for officers who have taken up one branch of the service, do much to remedy the inherent defects of the system; and the promotion in two grades by selection excludes the most incompetent officers from positions of great responsibility.

France.— The following establishments are included in the general system of education of officers of the French navy: The Polytechnic School, Medical Schools, Torpedo School, Machinists' School, Gunnery School and Artillery School. The *Polytechnic School,* founded in 1799, is the preparatory school for the scientific branches of the public service and is under the control of the Minister of War. Its organization is military, with a general officer of the army at its head. The pupils of this school are carefully selected at the start and the examination for admission ensures a high standard of preliminary attainment. The success of this school is so remarkable its influence on the public service of France has become a matter of history and it has taken a place among the very first of schools of its class in the world. In the *Naval School* of Brest, the methods of instruction adopted are similar, in a general way, to those of other French schools and colleges and resemble nothing in America. Recitation in the ordinary sense does not exist and textbooks are almost unknown. A few books of reference are used, including the nautical almanac and the admirable series of manuals published under the authority of the Ministry of Marine. The main feature of the system of instruction is the *cours,* or lecture. The *Engineers' School* (constructors) at Cherbourg is simple in its organization. It is under the general supervision of the Préfet Maritime and is inspected from time to time by the inspector-general of the corps of engineers. At its head is a constructing engineer as director. As the profession of naval construction is a favorite branch among the higher graduates of the Polytechnic, coming usually after mines and roads and bridges, the pupils are selected men and distinguished in a higher degree by earnestness, intelligence and thorough scientific attainments. They enter the school of application at the age of 20 or 21. The *Torpedo School* at Boyardville has two objects, the training of officers and men for the torpedo service and the performance of experiments for the development and perfection of the materials of this branch of maritime warfare. The two functions are largely performed by the same officers. The *School of Machinists* at Toulon was established by the decree of 13 Feb. 1879, and took the place of the two schools that formerly existed for a similar purpose at Brest and Toulon. The pupils at the school consist of firemen artificers, candidates for promotion to quartermaster machinists; of quartermasters and machinist pupils, candidates for second masters, and of second masters, candidates for first masters. Admission to the school is obtained after passing a double examination.

Germany.— The Naval Academy and Naval School at Kiel form really two establishments united under one government. The academy is devoted to the higher education of officers who have shown marked ability and who come as voluntary students. The school, on the other hand, is attended by midshipmen or acting sublieutenants and by cadets, and its courses are compulsory for all officers. At the academy and school the direction of all matters relating to instruction rests with the committee on studies, consisting of five members, who have extraordinary powers in regard to examinations. The regulations governing attendance at lectures and exercises are exceedingly precise and strict. There is also at Kiel the School of Engineers and Pilotage.

Italy.— The Royal Naval School of Italy is composed of two divisions, the first at Naples and the second at Genoa, the Naval School being considered as preparatory to that of Genoa. The general system of education is similar to that of France, there being a *gunnery school* (established by royal decree in 1873), a *torpedo school* (established in 1874) and a *school for engineer* mechanicians (establishd in 1862 at Genoa). The restraints imposed in general by discipline at Italian naval schools are numerous and severe. The students have no standing as officers and are simply designated as pupils. The scale of punishments ranges from the extreme of pettiness to the extreme of severity.

The true goal of the training at the Naval War College and naval schools is efficient co-ordination of effort or unity of action. This unity can be realized only through co-ordinate thinking of all persons in a naval service. The navy is a collection of individual minds, and if these minds are untrained the resultant is intellectual chaos. The intellectual acts of a naval officer in command of a force should follow after methodical thought in the following order: A clear grasp of the intention of instructions; a careful examination of all conditions bearing on the situation; a determination of intention; the communication of this intention to subordinates. The best training, as now admitted by all nations, large and small, having navies, is in war. If it were not for the stimulus of necessity, all effort in the world would come to an end. The Naval War College created an artificial war, at first called the *war game* and later known as *chart manœuvre*. This last term is a happy one, for it accentuates the fact that the strategist's real field of operations is the chart and is in keeping with Jomini's definition of strategy — «War on the map.» A further consideration will show that ordinary navigation is merely «sailing on the chart.» The war game or map manœuvre was a notable factor in the wonderful successes achieved by German arms against Austria in 1866 and France in 1870. The map manœuvre is truly the subcalibre method of training naval strategists. See NAVAL INTELLIGENCE.

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NAVAL GUNS. See GUNS, NAVAL.

NAVAL INSTITUTE, United States, an organization founded in 1873 at Annapolis, Md., by the officers of the Naval Academy. It issues bi-monthly *Proceedings* on naval affairs. It is regarded as one of the most important publications on naval affairs, because of the broad knowledge of its contributors. Each year the institute offers a life membership, a gold medal and a prize of $200 for the best essay or paper of interest to the naval service. The present membership includes a large portion of the officers of the navy.

NAVAL INTELLIGENCE. The Office of Naval Intelligence is charged with the collection and dissemination of such technical information at home and abroad as will be useful to the various bureaus of the Navy Department in the formulation of plans for war and in the development of personnel and material. The exigencies of war impose new and important duties upon naval intelligence. In peace the function of this agency is to keep in touch with naval problems, naval expansion and naval interest in all the countries of the world, so that the President, the naval administration and the responsible naval leaders in Congress may have access to the latest information with reference to naval affairs abroad. Its reports from naval attachés in the leading countries and from other sources furnish the General Board, the Chief of Operations and the bureaus data which give them the benefit of what has been learned or put into practice in other countries. During war its duties increase many fold — in touch with the naval districts and branch offices — it does a most important work in protecting naval and other plants making war material, preventing sabotage and in keeping an eye on alien enemies or others with a destructive propensity. A staff of vigilant and discreet confidential officers and civilians are on the alert to ferret out spies and other dangerous characters and secure their arrest. Close co-operation is had with the Department of State, War, Justice, Treasury and Labor, and, in addition, with the War Trade Board, the United States Shipping Board and the Alien Property Custodian. The interchange of information and the results of investigations with these departments of the government are most effective and valuable to the prosecution of war.

A detailed account of the work of this office should not be stated as it is of a highly confidential character, but, generally speaking, the scope of its activities include observation, investigation and report of all subjects affecting the navy and the prosecution of war from a naval point of view. It includes naval operations at sea and on land, the status, changes and progress of the material and personnel of foreign navies and a close counter espionage watch at home. This latter includes the investigation of unauthorized radio stations of alien enemies and suspects, of matters connected with the cable and mail censorship which affect the navy, the protection of water fronts and vessels, and of plants having contracts with the Navy Department, with a view of safeguarding those plants against sabotage. The guarding of ships while in port and the guarding against the danger from enemy agents among the passengers and crews are largely performed by the Office of Naval Intelligence. See NAVAL COMMUNICATION SERVICE.

NAVAL LAW. See LAW, MILITARY.

NAVAL MANŒUVRES. See ARMY AND NAVY MANŒUVRES.

NAVAL MILITIA. The first naval militia organization in the United States was established in the State of Massachusetts as a part of the organized militia on 29 March 1890. Other seacoast and lake States soon followed. In 1891 there was included in the Naval Militia Act, as passed by Congress, an appropriation of $25,000 for «Arming and Equipping Naval Militia.» This constituted the first Federal appropriation available for the purchase of arms, equipment, etc. Appropriations have been included annually in the Naval Act since that time. Ships were loaned to the organization and material and equipment issued by the various bureaus of the Navy Department for training purposes, the details being carried on by the «Office of Naval Militia.» The States themselves purchased clothing and equipment. Some equipment was loaned by the War Department. Annual practice cruises were made and the training of the naval militia gradually progressed. In February 1914 «An Act to Promote the Efficiency of the Naval Militia and for other Purposes,» commonly known as the «Naval Militia Act,» became a law, and is the act under which the naval militia has since operated. In accordance with this act, the Division of Naval Militia Affairs was established in April 1914, by taking over all work formerly performed by the «Office of Naval Militia.» A National Naval Militia Board, composed of naval militia officers, representing the north Atlantic, south Atlantic, Pacific and Great Lakes regions, convenes in Washington as often as necessary and is freely consulted in all important naval militia matters. Inspections of all naval militia organizations and divisions are made annually by officers of the navy, to determine whether or not the divisions are sufficiently armed, uniformed and equipped to participate in the allotment of Federal funds for the ensuing year. The first of these inspections was made in the spring of 1914, and as a result several divisions were disbanded. A board of naval officers formulated examinations for officers and enlisted men and standardized, in accordance with the National Militia Act, the qualifications of the naval militia personnel. This board met in Washington and, assisted by the National Naval Militia Board, formulated a report published in the form of a general order, which established the units of organization, distribution of personnel and other matters which in accordance with the act the Secretary of the Navy was authorized to prescribe — the unit of organization being the division (battalion). Aeronautic divisions and marine sections were authorized, while brigade and battalion organizations were maintained for administrative and other purposes. By the Act of 3 March 1915 a naval reserve force was authorized consisting of six classes: (1) The Fleet Naval Reserve, (2) the Naval Reserve, (3) Naval Auxiliary Reserve, (4) Naval Coast Defense Reserve, (5) the Volunteer Naval Reserve, (6) the Naval Reserve Flying Corps. The Fleet Naval Reserve is composed exclusively of ex-officers and ex-enlisted men of the navy who have left the service under honorable conditions and who are citizens of the United States. Men who have served one enlistment creditably and receive an honorable discharge may enroll in the fleet naval reserve with pay at the rate of $50 per annum. Those with eight years and less than 12 years naval service may enroll with pay at $72 per annum. Those with 12 years or more naval service enroll with pay at $100 per annum. Men who have served in the navy for 16 years or more may *transfer* to the naval reserve at one-third of their base pay plus all permanent additions thereto; and men with 20 years or more may transfer to the reserve at one-half their base pay plus all permanent additions thereto. In addition to these rates of pay men who enroll in the reserve receive an increase of 25 per cent for each re-enlistment. It is required of them, however, that they shall serve at least three months on active duty during each four-year period and re-enroll within four months. Men who transfer with 16 or 20 years' service are allowed a further increase of 10 per cent for extraordinary heroism in line of duty; and those with 20 years' active service are given a further credit of 10 per cent, provided their average marks in conduct for 20 years or more shall be not less than 95 per cent of the maximum. Men transferred to the fleet naval reserve, upon completing 30 years' service, including active and reserve, be retired with the pay they are then receiving plus the retired allowances. Men who enroll in the reserve may be retired after completing 20 years' service in the reserve and receive in lieu of their pay a cash gratuity equal to the total amount of their pay during the last term of their enrollment. Members of the fleet naval reserve may be examined for warrants and commissions in the reserve. Men who enroll in the reserve with four, eight or 12 years' active service are given a clothing allowance, each enrollment amounting to $30, which amount is increased to $60 in time of war or national emergency. As with all organized militia, the naval militia, even with the laws of 1914 and 1915, could not, under the Constitution, be called into service as such except for limited duties, such as to repel invasion. It could not be used outside the territorial limits of the United States. It is evident that, with such restrictions, militia could hardly meet the requirements of the navy in a foreign war, and to overcome this difficulty the "National Naval Volunteers" were created in the act approved 29 Aug. 1916. Under this act members of naval militia organizations were authorized to volunteer for "any emergency," of which emergency the President became the sole judge. By joining the navy as volunteers instead of being called as naval militia, militiamen can be used for any naval duty, free from the restrictions imposed on the naval militia as such. The value of this law became apparent as soon as the United States entered the European War. Practically every one in the naval militia at once volunteered and was sent to duty, thus giving the country the services of the trained men who otherwise could not have been used until the country was to be invaded. In the same bill that created the national naval volunteers, other laws were enacted that are of vital importance to the navy and country. That bill carried nearly all of the legislation that was needed to give the navy the personnel required for war. It provided organizations that in peace and at minimum cost prepared personnel for war, and the form of the laws was such that the personnel could be expanded to meet almost any emergency. Among the other important measures, the bill (1) provided for the United States naval reserve force; (2) increased the enlisted personnel of the regular navy to 68,700 and provided for further increase by the President to 87,000; (3) provided for the automatic increase of officer personnel in each corps to correspond with increases in enlisted men; (4) provided for naval flying corps, for special engineering officers, for taking over the lighthouse service by the navy in time of war, etc. The creation of the United States naval reserve force was a wise provision. The only training in peace times of reserve man power for the navy was in the naval militia, and even under the acts federalizing it the naval militia met only to a minor extent the deficiencies in personnel for combatant ships alone. It in no way met the requirements for personnel for auxiliaries, aviation, technical duties, etc. A much broader plan was necessary if the navy was to have sufficient man power and of the proper qualifications for war service. The naval reserve force legislation gave the navy the broad organization by which a reserve could be formed. The purpose of the reserve force is to enroll and train in peace time all kinds of personnel which in time of war or when the President declares a national emergency to exist can be called to the colors and thereafter be used in any capacity in the navy. This act became a law only a few months before war came and when only the very first steps to create the reserve had been taken. Nevertheless the law was so wisely drawn that the force could be rapidly built up even in war time. While it provided for the naval reserve force that has stood the country so well in war, the act further provided for war by increasing the permanent enlisted strength to 68,700 and permitting its further increase to 87,500, in the discretion of the President. As the permanent navy is the foundation of the naval structure, these increases, made when they were, put the navy in a position to expand on a sound basis, and especially so as in the same bill provision was made to automatically increase officer personnel when the enlisted personnel strength was increased. Up to the passage of this act the number of officers allowed for the navy was numerically fixed by law. Even though enlisted strength increased, officer strength could not be increased except by special legislation to that sole end. It is apparent that such a plan of increases was cumbersome and difficult, and upon the recommendation of the department a law was enacted in this bill that automatically changed the number of officers whenever the enlisted strength was changed. All corps and all grades in each corps were provided for in this legislation, so that now, when increases in ships of the navy occur, it is only necessary to authorize the enlisted personnel to meet those increases and the officers' personnel becomes immediately provided for. Had this provision not been in force when war was declared the navy could not have carried on its part in the war so quickly and so successfully. See United States Naval Reserve Force.

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NAVAL MINES. Naval mining is logically divided as follows: (1) Coastal mining, which denies to an enemy suitable ports, undefended or nearly so; (2) advance base mining; (3) off-shore or strategical mining; (4) battle or tactical mining, during an engagement between fleets. *Coastal mining,* outside of areas which are defended by coast fortification guns, does not require large or speedy vessels. Tugs, trawlers and light draught vessels, with naval reserve crews may be advantageously employed for this purpose. These vessels are provided with searchlights and suitable guns in order that they may properly guard their own mine fields. *Advance base mining* is the logical or legitimate duty of the active naval force. For this purpose an organized unit is supplied, consisting generally of several mine ships, six or more seagoing tugs, and two net layers. The mining ships are armed with a sufficient number of guns of proper calibre to defeat any attempt of raiding cruisers from interfering with the work establishing the advance base ashore and the laying of mines for the protection of the harbor. These ships are provided with all facilities to lay and pick up mine fields. The tugs are employed for sweeping areas which are to be used for fleet manœuvres or to sweep a channel to insure that hostile mines have not been planted. The sweeps, made of wire hawsers and chain, are hung between two tugs so that the bight of the sweep is dragged across the area to be swept. When the sweep fouls a mine it drags it from its moorings and explodes it. The net layers are used for laying submarine entangling nets across the entrance of a harbor or about a fleet when at anchor in an open roadstead. In mining the channels of an advanced base, mines are laid in the principal channels and as a rule are distantly controlled or exploded by observers ashore, when an enemy ship is sufficiently near them. *Off-shore or strategical mining* is done for the purpose of refusing or denying certain waters to the enemy. A sufficient number of mines are laid to make a venture by an enemy fleet extremely hazardous. For this mining, mine-laying vessels of considerable size and good speed are required, being accompanied by a mine depot ship and tugs. When occasion demands very high speed, scout cruisers or even destroyers should be used. High speed can be given mining vessels only by sacrificing mine capacity. In strategical mining a supporting force should always accompany the mine force to protect it from interference by enemy fast cruisers which might arrive before the mining has been completed. All hostile obstructions should be guarded against continuously. *Battle or tactical mining,* during an engagement between fleets, is accomplished by vessels of very high speed with characteristics on the order of scout cruisers, but with decks arranged to carry several hundred mines. The mines are laid in such localities during the progress of the battle that may be in the line of advance or retreat of the enemy. When an area is properly mined, one of the principal aims of the fleet is to force the enemy over the mine field. Battle mines may be either fixed or floating; but when off soundings, floating mines only can be used.

The United States has two mining branches. One branch is under the coast artillery and is employed as an element in the fixed defenses of the coast and the mine fields are covered by guns in fixed positions. The other branch is under the navy and forms a part of the active fleet. The control of the fixed mine defense belongs with the control of the fortifications and the control of the fixed land defenses and mine fields belong to the navy in order to insure complete co-operation between the mobile and fixed defenses of the coast. The fleet for its own safety should dictate the location of mine fields. As a rule the navies of Europe control the coast fortifications and the fixed mine fields.

Generally speaking, there are two types of mines — fixed and floating. The fixed or stationary submarine mine is fired by contact, electricity, timing device or fuse. Such mines are rugged in design and may contain large charges of explosives. They are placed in position by submarines and other especially equipped mine-laying vessels. Such mines are provided with anchoring devices and are deposited, if possible, in harbors and channels of the enemy or in the paths of ocean travel. Floating mines differ from fixed mines in that they are unanchored, and unless guard boats are at hand to warn friendly vessels of their proximity, may be as dangerous to friend as to foe. Such mines must be, according to laws of war, designed to become inoperative within a few hours or days — after being set adrift. They are often cast adrift in pairs, connected by a line about 100 feet long. If a ship runs between the two mines they are drawn alongside the ship, and exploded. See Submarine Mines.

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